



State of Utah
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF OIL, GAS AND MINING

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March 4, 2002

Ms. Karen Palmer
1600 South Red Hills Drive
P. O. Box 35
Richfield, Utah 84701

Re: Diamond K Gypsum Mine Plan, Diamond K Gypsum, Inc., Diamond K Gypsum Quarry
and B & J Placer Claims, M/015/041, Emery County, Utah

Dear Ms. Palmer:

Thank you for sending the copy of your amended plan of operations from 1998. Using this information and other information in our files, I have attempted to put together a mine plan for the Diamond K Gypsum Mine. Much of the information for the text of the notice of intention was contained in four different documents which the Division received October 26, 1998, February 12 and July 12, 1999, and January 27, 2000. The mine plan was spread out through at least four different documents, so it was difficult to determine exactly what commitments you had made and what the mine plan really was. It is for this reason that I have tried to assemble the plan.

I have taken the text information from the four documents mentioned above and have retyped it. I have also taken maps, photographs, vegetation, soils, and geology reports and put it into what I hope will be the beginning of a compiled mine plan.


While I have tried to be complete and not change any information, plans, or commitments, I ask that you look over the mine plan to ensure there are no problems. If you find something that needs to be corrected, please either write in the needed changes or call me. Once we have both agreed on the mine plan, the Division will make two copies and stamp them to show that they are approved.

I appreciate your time to look through this information. I'm sure I don't know your situation, but I recognize that you are very busy with running the company. My purpose in doing this is to help you fulfill the stipulation on your mine plan approval that you submit a compiled

Page 2
Karen Palmer
M/015/041
March 4, 2002

mine plan and to help both of us so we know what the mine plan is. There is no rush to have this completed. Thank you for your assistance. Please call me at 801-538-5261 if you have any questions.

Sincerely,

A handwritten signature in black ink, appearing to read 'P. B. Baker', with a stylized, cursive script.

Paul B. Baker
Senior Reclamation Biologist

jb
Enclosure: Compiled Mine Plan
cc: Dean Nyffeler, BLM, Price FO (UTU-69860)
kpalmerltr.doc

FORM MR-LMO FOR DIVISION USE ONLY
(Revised September 2000) File #: M/015/041
Date Received: / /

STATE OF UTAH
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF OIL, GAS AND MINING
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Salt Lake City, Utah 84114-5801
Telephone: (801) 538-5291
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NOTICE OF INTENTION TO COMMENCE LARGE MINING OPERATIONS

Division comments about this plan:

The plan presented here is a compilation by the Division of information provided by Diamond K Gypsum through various reviews. Some of these responses from the operator are difficult to understand out of context of the review. In these cases, the Division's review comments were included together with the operator's response. The Division's comments are italicized.

Although the operator's responses and commitments have been compiled in this document, the Division has attempted to make no changes other than to organize the plan. There were a few circumstances where periods were added or the first words in sentences were capitalized.

I. Rule R647-4-104 - Operator(s), Surface and Mineral Owners

1. **Mine Name:** Diamond K Gypsum
2. **Name of Applicant or Company:** Philip and Karen Palmer dba Diamond K Gypsum, Inc.
Corporation (X) Partnership () Individual ()
3. **Permanent Address:** 1660 S. Red Hills Drive
P. O. Box 35
Richfield, Utah 84701
Phone: 435-896-8870 Fax:
4. **Company Representative** (or designated operator):

Name:
Title:

Address: _____

Phone: _____ Fax: _____

5. Location of Operation:

County(ies) Emery

Township 22 South, Range 9 East.

Section 29 N $\frac{1}{2}$, SE $\frac{1}{4}$, SW $\frac{1}{4}$ SW $\frac{1}{4}$ Section 30 NE $\frac{1}{4}$, SE $\frac{1}{4}$ SE $\frac{1}{4}$ Section 32 N $\frac{1}{2}$, NW $\frac{1}{4}$ NW $\frac{1}{4}$ **6. Ownership of the land surface** (circle all that apply):

Public Domain (BLM)

7. Owner(s) of record of the minerals to be mined (circle all that apply):

John Elliott Welsh, Sr., LLC

John Elliott Welsh, Sr., Agent

Mining Claim Numbers:

B and J No. 2 #212727

B and J No. 5 #212729

B and J No. 6 #226190

B and J No. 9 #212732

B and J No. 10 #226191

South Salt Wash No. 1 #365869

South Salt Wash No. 2 #365870

8. Adjacent land owners:

Name: _____ Address: _____

Name: _____ Address: _____

Name: _____ Address: _____

Name: _____ Address: _____

9. Have the land, mineral and adjacent land owners been notified in writing?

Yes _____ No _____

If no, why not?

10. Does the operator have legal right to enter and conduct mining operations on the land covered by this notice? Yes _____ No _____.**II. Rule R647-4-105 - Maps, Drawings & Photographs**

105.1 - Base Map

105.2 - Surface Facilities Map

- Area A—Mined out—reclaimed
- Area B mine 1997-1998
- Area C new project mining area
 - a) boundary defined by drainages
 - b) actual mineable area of gypsum

Surfaces disturbance in Area C is proposed in 5 acre increments, where "topsoil" will be removed first and stockpiled, then overburden will be removed to uncover high parity [purity] gypsum resource as approximately mapped within Area C. When the high grade gypsum is move out of a 5 acre area, then this area will be backfilled with overburden and covered with topsoil. The topsoil will be a rock/soil type mixture in order to avoid a sterile monomineral gypsum reclaimed surface. The total acres of resource is approximately 20 acres, the total surface disturbance approximately 30 acres.

The 1:6000 scale topographic map shows the BJ Nos. 5, 6, 9, 10 and SSW Nos. 1, 2 unpatented placed mining claims which are or may be involved in the Diamond K Gypsum quarrying operations of gypsum rock from 1999, continuing for several years.

The 1:2880 scale map, an overlay of an aerial photo, shows:

- 1) The aerial perimeter of the approximately 20-acre gypsum rock resource in Area C.
- 2) Previously quarried Area B, now recontoured and reclaimed.
- 3) The active 1999 Haul road from quarry to Moore Road with culverted turnaround across South Salt Wash.
- 4) Subdivision of the resource into 1 acre lots Nos. 1 to 32. The probable quarrying sequence of lot Nos. is indicated.
- 5) The maximum total disturbance for all of Area C is 30 acres.
- 6) The initial quarry, now operating, in Area C is in Lots Nos. 1, 2, 5, 6. Topsoil and overburden stockpiles are indicated.

The approximate acreage estimate of 8.01 is acceptable as the current site disturbance. The small isolated area labeled "Area B" shown on the surface facilities map to the west of the Area B Quarry is undisturbed and abandon in all mining plans. This area is undisturbed and natural in vegetation and soil.

105.3 - Additional Maps

Six photos are submitted which show the 1998 unmodified South Salt Wash drainage and the 1999 culverted South Salt Wash crossing; mine Haul Road of 750 linear feet from El. 6530 to 6580, 6.7% gradient, to the Emery County Moore Road; Area C before quarrying and after initial quarry showing haul road turnaround loop across South Salt Wash.

Two 4-foot diameter culverts, placed in the South Salt Wash channel are adequate to handle "10 year flash flood runoff events." The turnaround loop of five feet of fill is above the maximum level of the flood plain of South Salt Wash.

Division review comment: As previously requested, please provide a cross section drawing of the road crossing(s) for the South Salt Wash to Area C.

Operator response to review comment: Drawing enclosed labeled CUV-01

III. Rule R647-4-106 - Operation Plan

106.1 - Mineral(s) to be mined:

106.2 - Type of Operation Conducted:

Approximately 15 feet of a nearly horizontal gypsum bed will be removed from a partially dissected stratigraphic bench. Stripping and mining will not effect the distributaries of South Salt Wash drainage. The stream, channel bordering Area C on the SW may carry local cloudburst water, but does not have a large drainage area. Neither surface water discharge nor stockpiled material erosion is anticipated. Minor gullies will be backfilled and recontoured as part of the stripping.

A D-9 cat dozer is used to strip off overburden from the gypsum-rock. "Topsoil" zones B and C, one to two feet thick are initially removed and stockpiled separately. Overburden rock is secondarily removed, stockpiled separately. These 1999 stockpiles are noted on 1:2880 scale map.

Gypsum rock is quarried with a modified RR250 cat reclaimer. A 950 cat loader collects and places the fragmented gypsum rock into a stockpile at the edge or within the quarry for loading and haulage off of the property.

The total acreage of the gypsum-rock is approximately 20 acres. The "topsoil" zones B and C average less than 1 foot thick. There is no organic soil Zone A. Overburden to high purity gypsum rock varies from 2 to 15 feet. There is one plus 10 foot overburden area in lots 7, 10, 11, 12, 19, 20.

Topsoil, overburden, and ore stockpiles, and mine roads are to be confined within the resource boundary. Backfilling, recontouring, topsoil replacement is progressive and concurrent with quarrying.

Acreage estimations in Area C of 0.54 acres topsoil and 0.20 acres overburden are correct.

106.3 - Estimated Acreage

Gypsum rock resource is approximately 20 acres. Maximum surface disturbance to mine Area C, is 30 acres. Aerial mining sequence is proposed in six areas defined by acre lots. This plan covers a minimum 10 year operation.

Proposed schedule for mining and reclamation revised June 25, 1999. (enclosed)

Division review comment: The Division has used the revised schedule provided by DKG to prepare a new schedule of acreage disturbed and reclaimed for the years of 1999 to 2008. The section in the February 12, 1999, DKG submission under the heading of R647-110.3 mentioned that a new road would be created and the old road would be abandoned. This latest schedule of mining and reclamation from DKG did not include any disturbed acreage for new road area or reclaimed acreage for the old road.

At the DKG operations the haul road is developed within the footprint of the mined out areas. As the mined out areas are reclaimed the access road remains unreclaimed for access to the next block to be mined until access to the last area of mining is no longer needed. At the time of final reclamation this remaining road would be reclaimed.

The possibility of DKG's last access road being assumed by the County in replacement of the existing steep road would not be known until near the end of the mine life. For this reason the Division has included a figure of 2.6 acres of main access road allocated in the schedule of mining and reclamation (see attached) over the years of active mining. This main access road was assumed to be located within the various mining blocks reaching the last mined block at the farthest border of the Area C grid of blocks. Please acknowledge this road acreage is acceptable, or provide information to support an alternate acreage.

Active mining areas of five (5) acres were assumed for the purpose of calculating a reclamation estimate. If the proposed reclamation schedule is followed, the maximum unreclaimed area, at any one time, would be kept to a minimum. Reclamation of a previously mined area cannot occur until the new active mining area has been created. For estimation purposes the Division has assumed the maximum unreclaimed area to include an inactive area previously mined, the last active mine area, and main access road. The active mine area would include the quarry floor, the overburden stockpiles, and topsoil stockpiles. This total is based on five (5) acres of inactive mine area, five (5) acres of last mined area, and 2.6 acres of main access road. Please acknowledge this acreage as being acceptable, or provide information to support an alternate acreage.

Operator response to Division comments: Yes, this is true. The haul road is included in the disturbed area with exception of this small access road off the Moore Road.

We also agree as to the haul road remaining unreclaimed for access to the next block to be mined until access to the last area of mining is no longer needed. At that time final reclamation would be completed.

We have no problem with Paragraph 4, your calculation to include a figure of 2.6 acres of main access road to be allocated over the years of active mining. We realize that the current road acreage is approximately 1 acre, but will expand as time goes on.

In Paragraph 4 of 106.3, we think this is reasonable in the long term mining plan. However, Area B has been reclaimed and reseeded with the BLM recommendation of mixture seed twice and we have seeded with our own mixture twice as well as transplanted grasses. It's showing good growth and has been over a period of three

years and it is of our opinion that close attention should be taken to releasing that initial 3.32 acres.

106.4 - Nature of material including waste rock/overburden and estimated tonnage

106.5 - Existing soil types, location of plant growth material

Within Area C, the principal soil is 1-2 foot flocculated gypsum. Some of the gypsiferous soils are cryptogamic with lichen growth, but most are barren. In the gullies the outcrops are weathered gypsum without soils. Overburden is siltstone, and the lower slopes below the gypsum bed is siltstone. These siltstone areas have more colluvium of silt and clay and the soils though thin (1) one foot have more vegetation.

The upper (1) foot of the soil over each acre is stockpiled separately from the overburden stripping. This method saves the native seed bank. The barren overburden varies in thickness from 0-4 feet. Usually 2-3 feet of weathered gypsum needs to be removed before quarrying the gypsum resource. The volume of stockpiled soil is approximated at 40,000 cubic/feet/acre. The soil development is minimal, but mixing gypsiferous arid silty clay soils with gypsiferous soil in reclamation will enhance plant recovery.

106.6 - Plan for protecting and redepositing existing soils

Segregation of the upper one foot of stripping from overburden is important to preserve the residual seed bank. This material will be spread evenly across the reclaimed areas. Soil stockpiles are stored adjacent to the active quarry, then redistributed after the mined out quarry is first covered by stockpiled overburden. Protecting and redepositing salvaged soils requires no specific procedures, because storage is outside cloudburst threat.

106.7 - Existing vegetative communities to establish revegetation success

The plant frequency on gypsiferous soils may range from one plant/square foot to less than one plant/square yard. *Lepidium montanum* may have a uniform distribution of one plant/square foot. *Atriplex confertifolia* may have an irregular distribution and occur less than one plant/square yard. Much of the gypsiferous soil on south facing slopes is barren.

Indigenous Plant Species Chart No. 1

DKG will apply and use 1995 vegetation survey.

106.8 - Depth to groundwater, overburden material & geologic setting

Groundwater is 500 feet or greater below the surface. There are no aquifers above the Page/Navajo sandstones.

Overburden above the gypsum resource is mapped on Area C. This overburden is siltstone.

Geology: Frank Royse Jr., Detachment fold train, Reed Wash area, west flank of San Rafael Swell, Utah: The Mountain Geologist, Vol. 33, No. 2 (April 1996), p. 45-64.

106.9 - Location and size of ore and waste stockpiles, tailings and treatment ponds, and discharges

Resource: The gypsum resource is conservatively estimated at 2000 tons/acre foot with a maximum quarried thickness of 10 feet of gypsum rock. Approximately 20 acres have recoverable gypsum resource. The entire proposed disturbed area may reach 30 acres.

Overburden of siltstones above the gypsum rock is approximately 3 feet. Average overburden of weathered and impure gypsum rock is estimated at 3 to 4 feet thick. Overburden and topsoil will be replaced as the quarrying proceeds, keeping the maximum unreclaimed acreage less than 5 acres.

IV. R647-4-107 - Operation Practices

107.2

The crossing of South Salt Wash drainage has been constructed with culverts to carry off the seasonal rainfall, snow melt and the occasional flash flood runoffs. There has been only one (1) cloudburst flood in the South Salt Wash drainage occurring in 1990, which would possibly wash away the constructed road crossing. The maintenance on crossing and culverts will be done as needed to allow truck crossings, and keep open runoff in South Salt Wash.

107.5

Soils are immature, mainly weathered gypsum rock and residual silt and clay from siltstones. Colluvium within the resource and proposed disturbed boundaries is minimal.

The upper foot on two of stripping is temporarily stockpiled for the purpose of retaining the indigenous seed bank, and will be replaced in the mined out quarry above backfilled overburden.

107.6

Concurrent reclamation is planned for the quarrying operation. Once the quarrying methods and area is established it will be possible to backfill and to reclaim in concurrently with the operation. Since the quarrying will be on a stratigraphic terrace above existing drainages and gullies there is no need for temporary stabilization of overburden or topsoil piles.

Once a quarry area is "mined out" then it may be reclaimed if it is outside the next mining activity area. Backfill of overburden, replacing topsoil, recontouring and reseeding may timely follow quarrying of the gypsum rock resource. The maximum disturbed acreage at any time may not exceed (5) five acres.

V. Rule R647-108 - Hole Plugging Requirements**VI. Rule R647-109 - Impact Statement****109.1 - Surface and groundwater systems**

The ecology of the major drainage of South Salt Wash was permanently changed by discharges of calcareous fine-grained material from the I-70 quarry, 2 miles to the East, during a series of cloudbursts several years ago. Whatever volume of material may wash from area C during the Diamond K quarrying operation and after reclamation will actually be reversing this I-70 riparian change. Diamond K is not responsible for existing sedimentation and floral changes in the South Salt Wash riparian flood plain and channels.

There are no groundwater systems in the gypsum sequence of the Jurassic Carmel Formation in the South Salt Wash area of the T. 22 S., R. 9 E.

The road crossing of South Salt Wash is constructed of rock material derived from the local adjacent area. The lithologies are compatible with the present sediment load in the drainage. The channel sediment load is silty lime mud derived by a 1990 cloudburst flood from the I-70 quarry site, 2 miles east.

Any locally derived sediment of gypsiferous and/or silty soil from the quarrying operation that washes into the South Salt Wash sediment load would be a reversal of this 1990 environmental change.

The installed culverts will handle the seasonal intermittent flow observed in South Salt Wash. There is no environmental impact caused by this road crossing.

109.2 - Wildlife habitat and endangered species

Seldom have native mammal or reptilian animal species been observed in ten years on the undisturbed gypsiferous outcrops of the B and J claims between the Moore Road and I-70. There are many species of ground dwelling animals on the silty limestones to the East beneath the juniper trees. Active gopher holes are rarely present in the joints of the gypsum rock outcrops and these area may also have larger predatory badger holes.

Once the quarrying commences, then a different opportunist ecological niche is established. Temporary attractive habitat for animals is established by the presence of water in the quarry. Pollinating insects, birds, reptiles, and small mammals are abundantly present during the quarrying operation. After reclamation, there are again no animals. This observation is a good reason for leaving the quarry(s) as closed catchment basins. There are also rare, transitory, large mammals in the general area, such as mule deer, antelope, coyotes, mountain lion.

Discussed clearance for threatened and endangered plants with the BLM in 4/99. The area was cleared by the BLM. They are content with the use of the 1991 survey. I

personally inspect the area every year and agree to notify the BLM if any cactus are present or threatened & endangered wildlife \ habitat.

109.3 - Existing soil and plant resources

109.4 - Slope stability, erosion control, air quality, public health & safety

There are no anticipated erosional impacts in Area C. The drainages and gullies are all "dead headed" without basins for accelerating flash floods. Only a 1:10 year cloudburst directly on Area C, will erode stockpiles. The stockpile material is a compatible component with the South Salt Wash bedload.

DKG will include in its erosion treatment plan the practice of roughening the surface rather than the use of furrows.

VII. Rule R647-4-110 - RECLAMATION PLAN

110.1 - Current land use and postmining land use

Grazing is the only multiple use since the 1960's. In the late 1950's and early 1960's non-permitted "wildcat" oil and gas wells were drilled north and south of the Moore Road. Roads to the well sites give excellent access south between the Moore Road and the I-70 interstate and north to Eagle Canyon across the SID and CHAR unpatented Placer mining claims.

Grazing will continue to be the main activity after quarrying of the gypsum

110.2 - Reclamation of roads, highwalls, slopes, leach pads, dumps, etc.

The mine road will eventually be extended after Area C is mined out, to connect with the ridge road in Secs. 31, 32, T. 22 S, R. 9 E. This will give truck access to additional gypsum resources to the South toward I-70, and allow the abandonment and reclamation of the present steep crossing of the South Salt Wash in NW/4 Sec. 30, T. 22 S., R. 9 E. This mine road will become the permanent road toward the South.

Area C will be reclaimed in 5 acre increments, concurrently with the mining by backfilling and topsoil emplacement. The final contour will approximate the present surface except 15 feet lower. The grading and furrowing of the surface will be designed to limit surface run off, retain moisture, and smooth out minor gullying. The final gentle north slope into South Salt Wash with a variable "topsoil" content will be more favorable for secondary plant growth (South facing slopes and mono gypsum mineral soils are difficult to reseed, being originally poor in plant diversity and density.)

The area C, after quarrying will have a rolling 5% to 7% northwest slope. Furrows parallel with the contours will concentrate water to prevent rill wash and gullying. There will be no high walls, steep slopes, or pits left on the property. Existing natural channels have upstream terminations and small collection areas, so these may be recontoured to blend into the new quarry elevations.

DKG will include removal of road, all culverts and replacement of drainage in the reclamation plan.

110.3 - Surface facilities to be left

Mine Road—Crossing South Salt Wash

The crossing of South Salt Wash with culverts may be moved and adjusted to satisfy the efficient loading of gypsum from the quarries in Area C. A final site crossing position will be chosen after Area C is exhausted. This ultimate crossing will access a new road segment capable of truck haulage of the gypsum resource from farther south. This road will connect with the existing "ridge road" toward I-70, and the "wildcat" well sites.

This new access route will be the mine haulage road for the next 10 to 20 years; and allow abandonment of the existing steep, non-truck access road and stream bed South Salt Wash crossing. See 1:6000 scale map of existing steep road through B and J Nos. 9 and 10. See, proposed direct, gentle grade route through B and J Nos. 6 and SSW No. 2.

The final disposition of the mine road will be negotiated with Emery County, after the gypsum rock resource is depleted. The abandonment of the steep existing road and its reclamation may be possible in the next 10 years, if all parties agree.

The access road will remain in place during active mining operations and will be included in reclamation plan after mining operation cease.

110.4 - Treatment, location and disposition of deleterious materials

110.5 - Revegetation planting program and topsoil redistribution

A major effort will be made to stockpile the topsoil. The topsoils will be mixed when replaced to preserve the native seed bank within the soil, and avoid mono-mineralogical gypsum surfaces. Annual "dry land pasture" seed mixes will be used to stabilize stockpiles topsoils and on newly reclaimed and recontoured areas after quarrying. This practice will enhance the grazing recover, stabilized the surface, provide cover for generation of the native perennial plants. Selective transplanting and reseeding of native plants will be determined as warranted.

The July 1996 Revegetation plan will be followed for the new expansion.

R647-4-111 Reclamation Practices

The reclamation will follow quarrying in 3 to 5 acre increments. Overburden will be recontoured to be compatible with the new quarry elevations. Mixed top soil will be replaced as a thin veneer over the entire area, then reseeded.

VIII. Rule R647-4-112 VARIANCE

A variance is requested for (110.3) the South Salt Wash Drainage Crossing. There is no possible adverse impact to this drainage because the 1990 cloudburst deposited a foreign bedload of silty carbonate from the I-70 materials quarry and completely changed the riparian environment. There has not been another cloudburst of that magnitude. The truck crossing will be maintained, culverts cleared, and access open as long as the quarrying continues. At the termination of quarrying, the crossing will be either removed or turned over to the responsibility of Emery County.

A variance is requested for (110.5) revegetation. Annual dry land pasture seed mix will be used to stabilize stockpiles of topsoil and as the first seed application on newly reclaimed and recontoured areas. This will allow the perennial native seed bank within the topsoil to germinate. A decision of replanting or transplanting native plants will be determined after one year after topsoil replacement. It has been observed in practice that the seed bank in the topsoil is the most effective replacement for native plants.

DKG plan on the removal of all roads, culverts and repair of natural drainage. A variance is not needed at this time.

IX. Rule R647-4-113 - SURETY

Reclamation costs should be covered by minimum surety bonding. Reclamation will follow mining in 5 acre increments so that the reclamation costs will not be cumulative.

Diamond K Gypsum, Phillip Palmer DBA, will carry a surety bond or have a security deposit in a dollar amount necessary to cover the surface restoration of the San Rafael mining operation. The surety will be a sufficient amount to recontour and reclaim the maximum disturbance of the mining operation at any one time.

Diamond K Gypsum Inc., Phillip Palmer DBA, will carry liability insurance in the amount of \$1,000,000 (one million dollars) for an and all activities in the gypsum rock quarry operations in Sec. 29, T. 22 S., R. 9 E., approximately 2 miles northwest of the intersection of the Moore Road, Emery County Route #1612, and Interstate I-70 in the U. S. BLM San Rafael Resource Area, Utah.

John Elliott Welsh, Sr., LLC, John Elliott Welsh, Sr. DBA 4780 Bonair Street, Salt Lake City, Utah 84117-5319 will be listed as an insured certificate liability holder for this policy.

All appropriate mine safety procedures, practices, personal gear will be used by employees, visitors, and all other that enter the mine property. Visitors and all others will sign a liability release. Trespassers will be told to exit.

The Gypsum quarries have specific high intensity surface light reflectivity. This high light intensity requires dark safety glasses and sunscreen for persons within the quarry.

See attached surety estimate.

Due to the good faith effort Diamond K has extended into reclaiming the Area B 3.32 acres, we feel due consideration should be made in releasing that, therefore reducing

the bond amount. Please take this under consideration and let us know if you deem this acceptable.

XI. SIGNATURE REQUIREMENT

I hereby certify that the foregoing is true and correct.

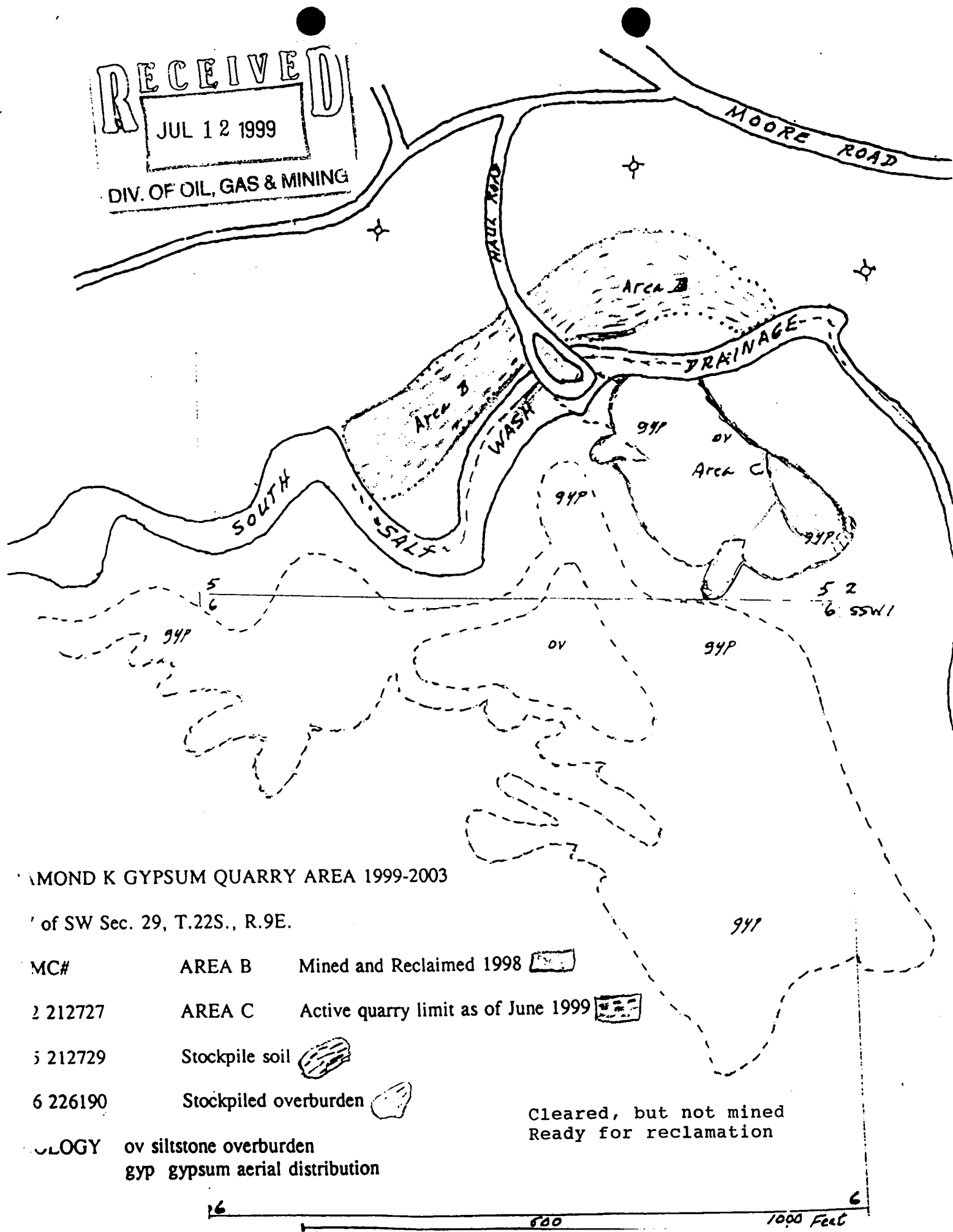
Signature of Operator/Applicant:

Name (typed or print):

Title/Position (if applicable):





Date:

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 JUL 12 1999
 DIV. OF OIL, GAS & MINING



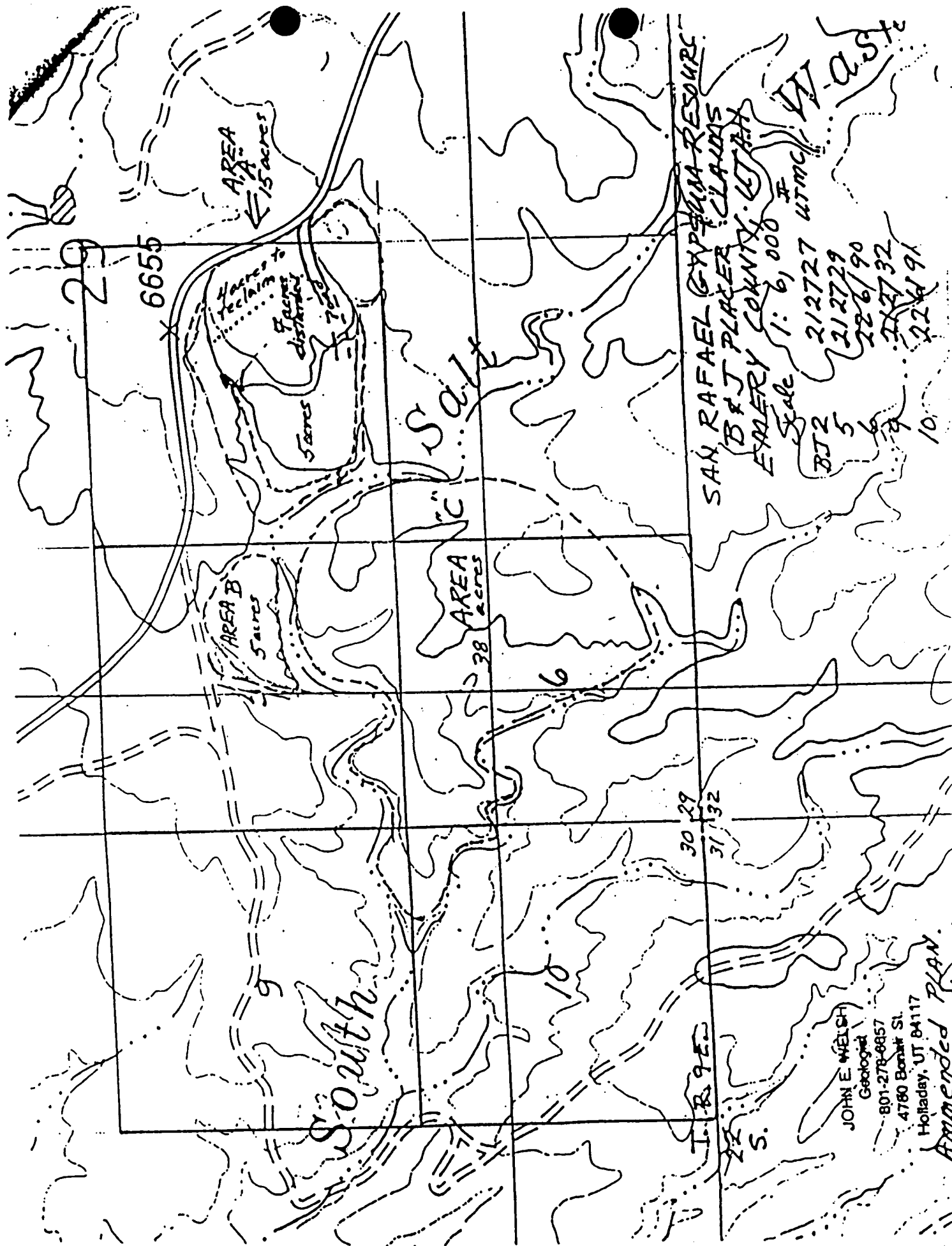
DIAMOND K GYPSUM QUARRY AREA 1999-2003

of SW Sec. 29, T.22S., R.9E.

| | | | |
|----------|-----------------------|---|---|
| MC# | AREA B | Mined and Reclaimed 1998 |  |
| 2 212727 | AREA C | Active quarry limit as of June 1999 |  |
| 5 212729 | Stockpile soil |  | |
| 6 226190 | Stockpiled overburden |  | |

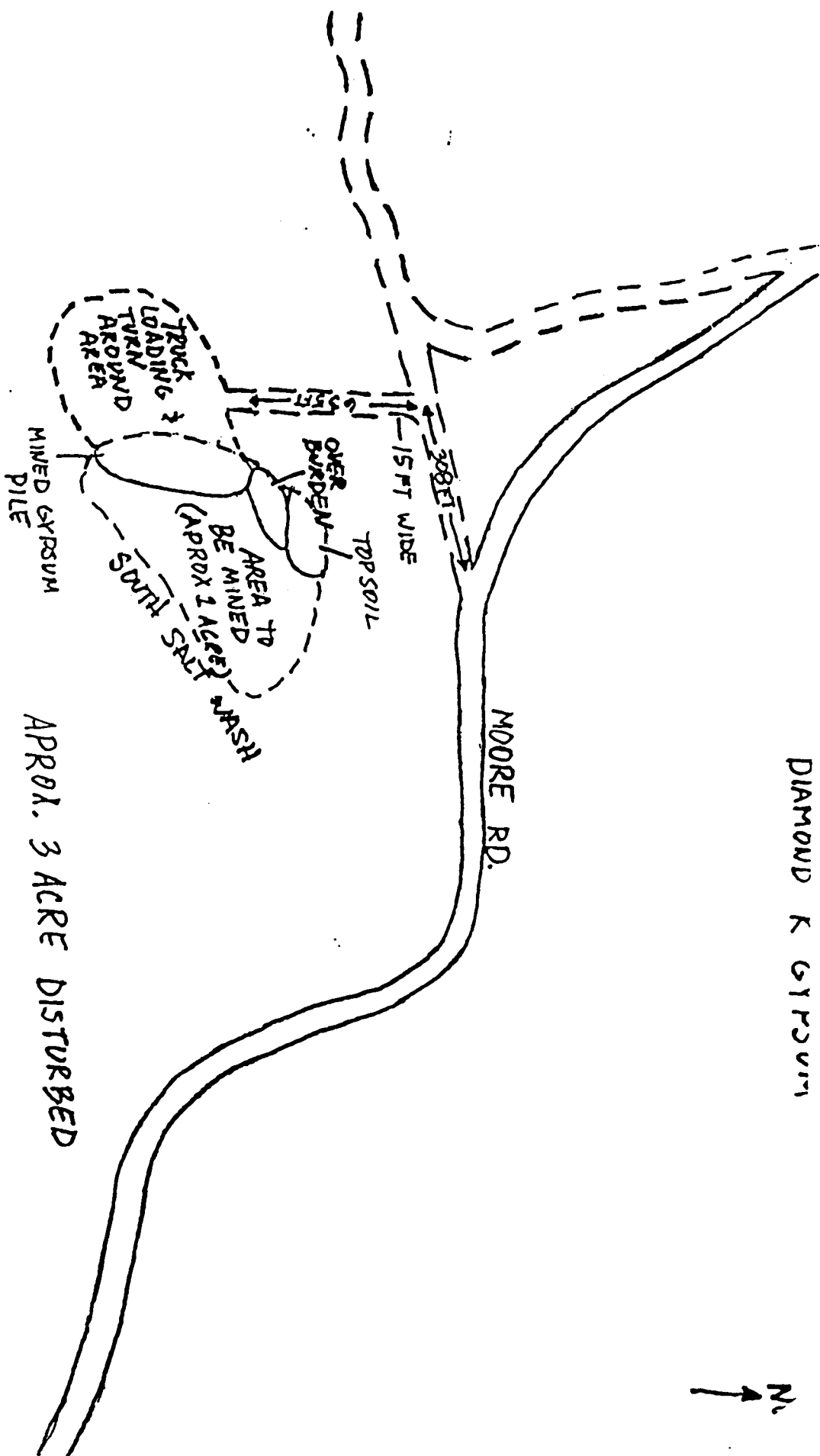
Cleared, but not mined
 Ready for reclamation

GEOLOGY ov siltstone overburden
 gyp gypsum aerial distribution

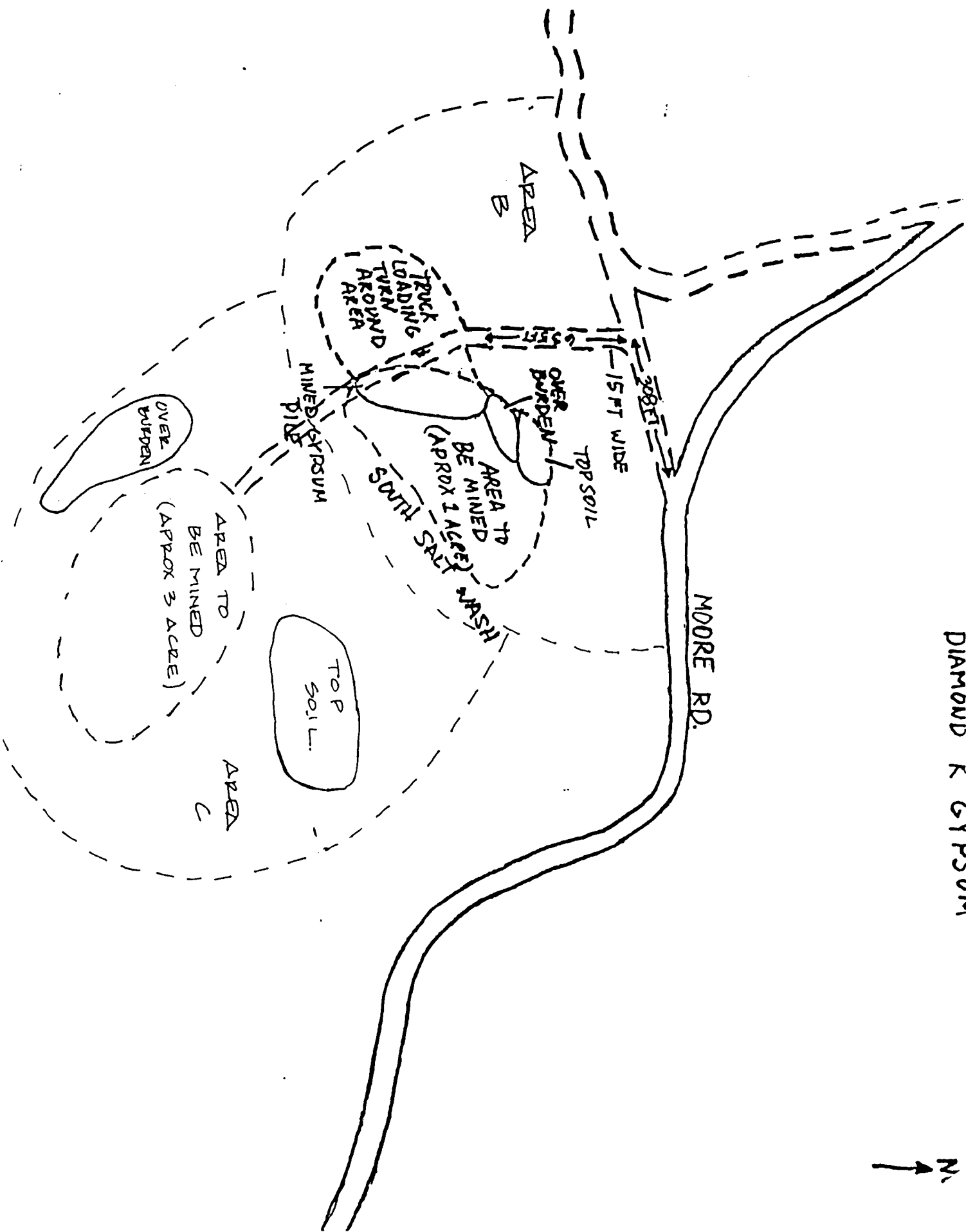


DIAMOND K GYPSUM

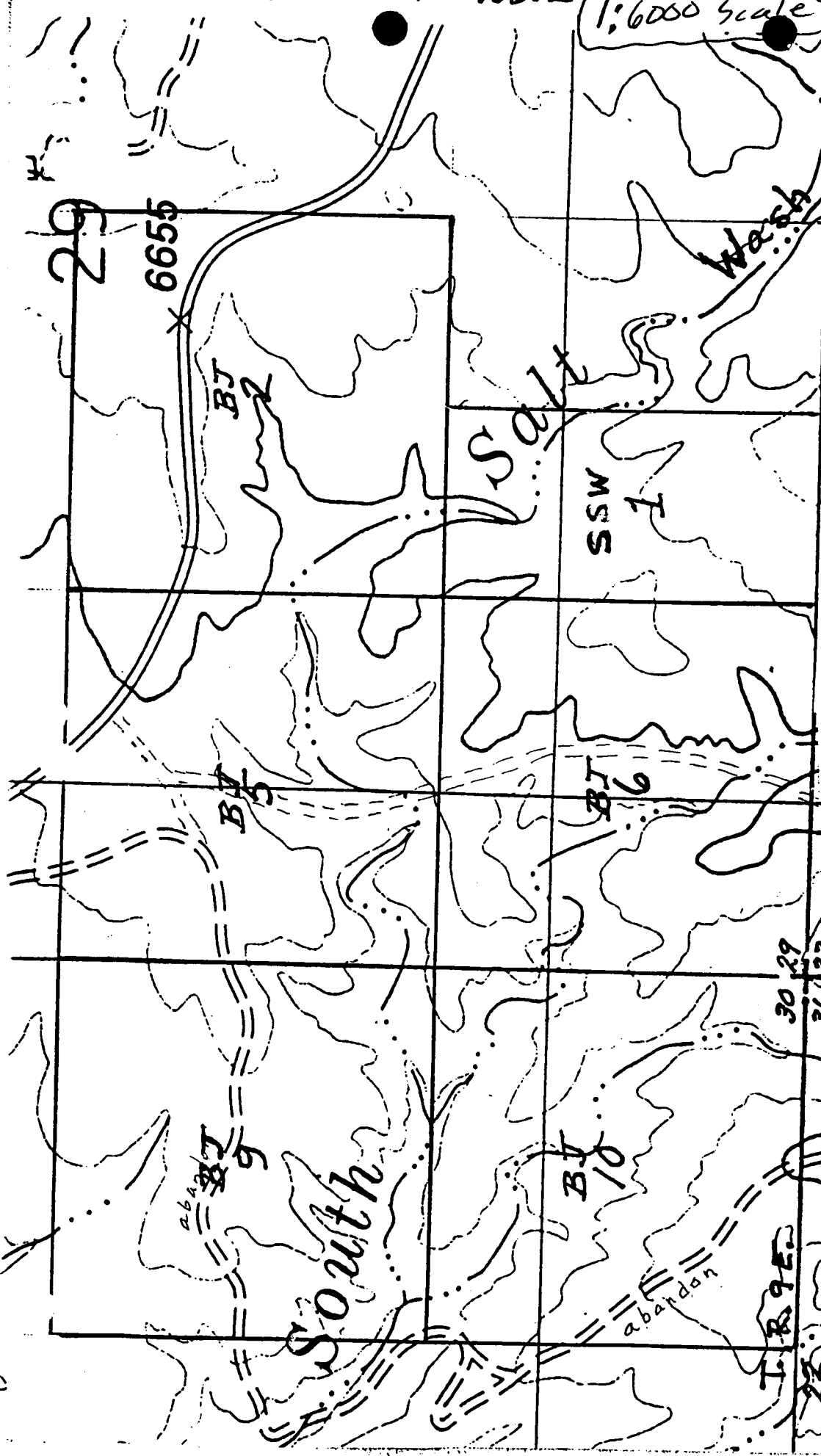
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DIAMOND K GYPSUM



1:6000 scale

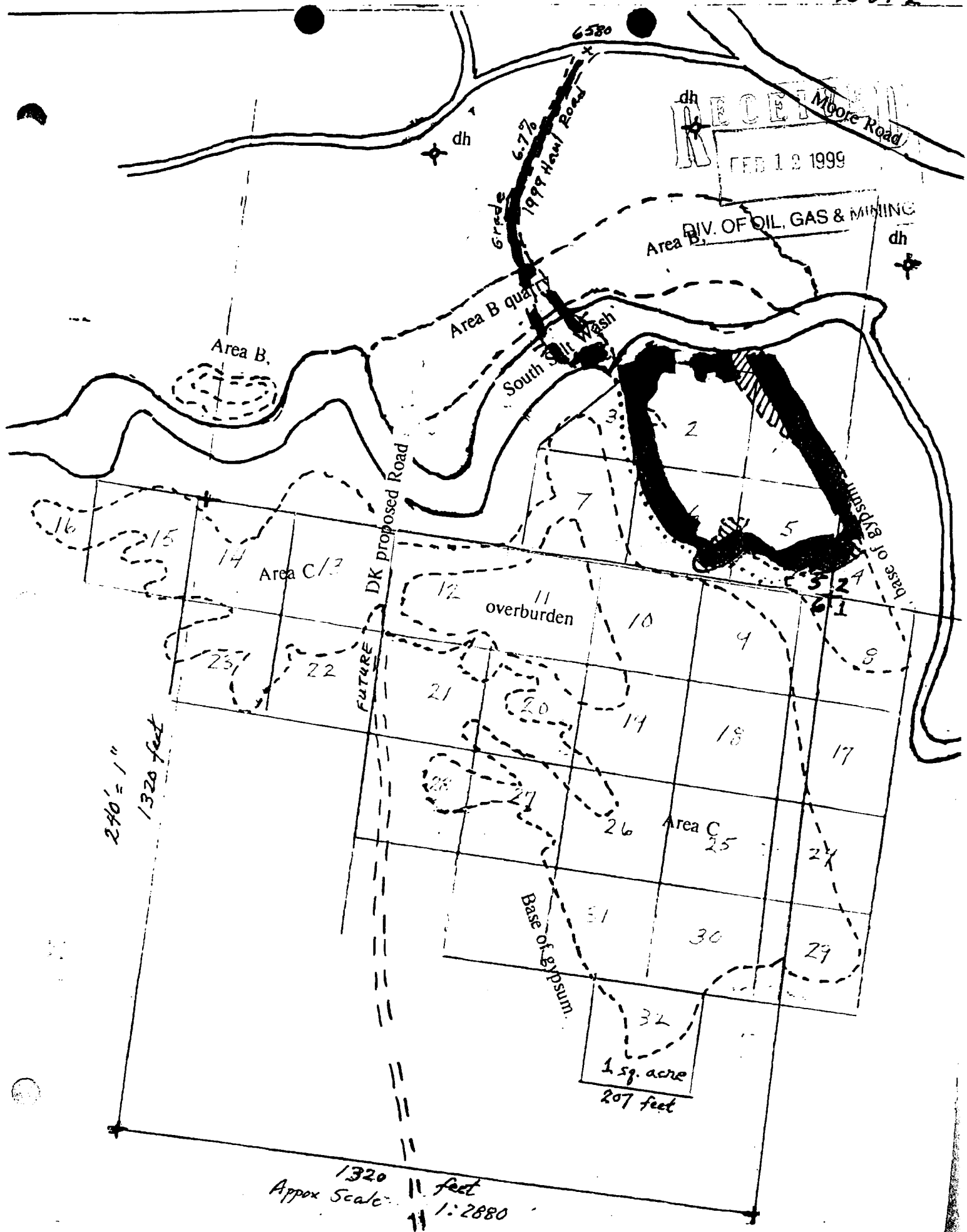


**SAN RAFAEL GYPSUM RESOURCES
UNPATENTED PLACER MINING CLAIMS
EMERY COUNTY, UTAH**

SCALE 1 : 6,000

| Ab. | uMC |
|-------|-----------|
| BJ-2 | # 212727 |
| BJ-5 | # 212729 |
| BJ-6 | - #226190 |
| BJ-9 | # 212732 |
| BJ-10 | # 226191 |
| SCM | L 315849 |

JOHN E. WELSH
Geologist
801-278-6857
4780 Bonair St.
Holladay, UT 84117



1
ACRE

RECEIVED
FEB 12 1999

DIV. OF OIL, GAS & MINING

0 500' 1000'

Existing
steep road
to south

1:2880 scale

1999 Haul Road

Moore Rd 16/2

PRESENT
QUARRY
DISTURBANCE

Top soil

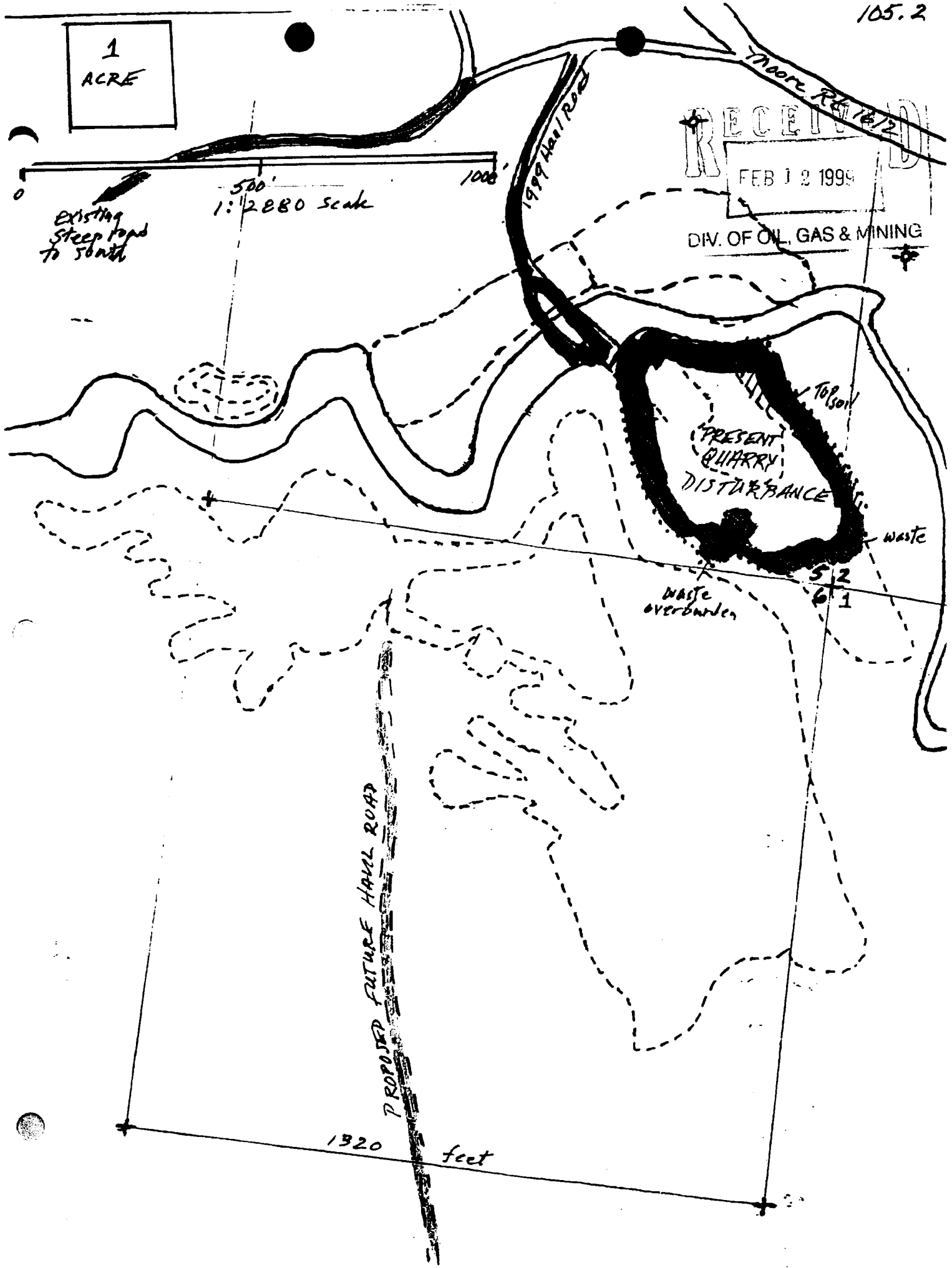
waste

Waste
overburden

5/2
6/1

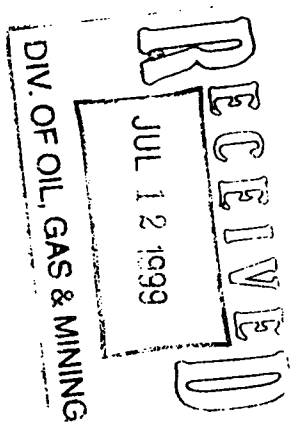
PROPOSED FUTURE HAUL ROAD

1320 feet



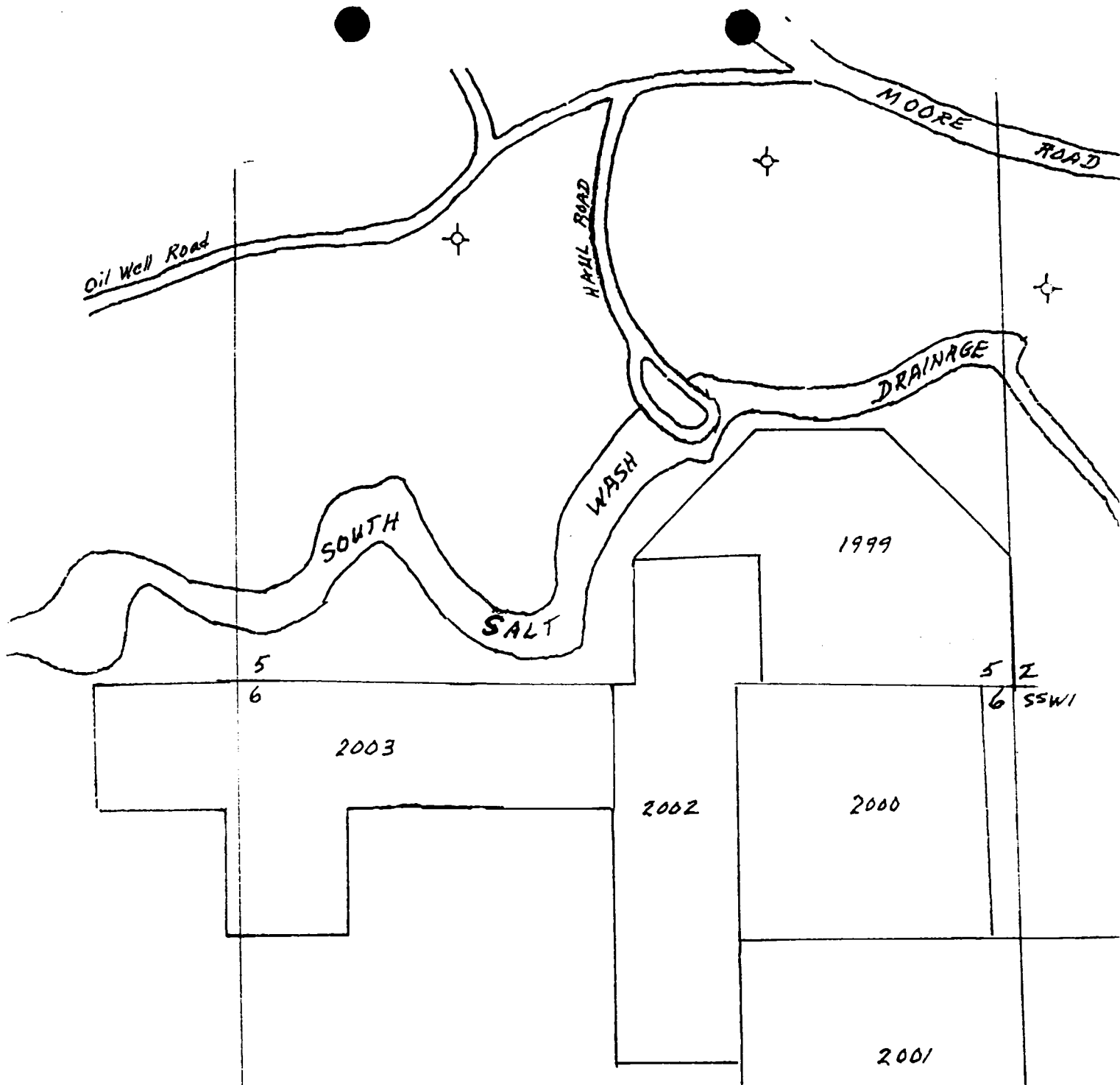
MINE SCHEDULE OF ACREAGE DISTURBED & RECLAIMED
M/015/041 (UTU-69860) DKG Quarry
Diamond K Gypsum, Inc. Emery County

last revision June 25, 1999



-Total project disturbance as of 4/14/99 is estimated as 8.01 acres
-Assumed that after 1999 4 or 5 additional acres of mine area would be disturbed each year
-Assumed that after 1999 4 or 5 acres of disturbance would be reclaimed each year
-Assumed that mining new areas stops in year 2003 & reclamation of remaining disturbance occurs in 2004
-Column "beginning disturbance" = disturbance existing at beginning of the year
-Column "total disturbed" = beginning disturbance + total new
-Column "adjusted total" = total disturbed = released this year

| YEAR | Adjusted Total | Total Disturbed | Beginning Disturbance | Total New | New Road Area | New Mine Area | Reclaimed this year | Released in 3 yrs | Released in 2 yrs | Released in 1 yr | Released this year |
|----------------------------|-------------------|--------------------|--------------------------|--------------|---------------------|---------------------|------------------------|----------------------|----------------------|---------------------|-----------------------|
| NOW | 8.01 | 8.01 | 8.01 | 3.3 | 0 | 3.3 | 3.18 | 3.18 | - | - | - |
| 1999 #1 | 11.4 | 11.4 | 8.01 | 0 | 0 | 3.3 | 3.18 | 3.18 | - | - | - |
| 2000 #2 | 15.4 | 15.4 | 11.4 | 4.0 | 0 | 4.0 | 4.0 | 4.0 | 3.18 | - | - |
| 2001 #3 | 20.4 | 20.4 | 15.4 | 5.0 | 0 | 5.0 | 4.0 | 4.0 | 0 | 3.18 | - |
| 2002 #4 | 22.62 | 25.9 | 20.4 | 4.0 | 0 | 4.0 | 4.0 | 4.0 | 4.0 | 0 | 3.18 |
| 2003 #5 | 22.62 | 26.62 | 22.62 | 4.0 | 0 | 4.0 | 4.0 | 10.0 | 4.0 | 4.0 | 4.0 |
| END OF MINING IN YEAR 2003 | | | | | | | | | | | |
| 2004 | 12.62 | 22.62 | 22.62 | 0 | 0 | 0 | 10.0 | 10.0 | 4.0 | 4.0 | 4.0 |
| 2005 | 0 | 12.62 | 12.62 | 0 | 0 | 0 | 12.62 | 10.0 | 10.0 | 4.0 | 4.0 |
| 2006 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 12.62 | 10.0 | 10.0 | 4.0 |
| 2007 | | | | | | | | | 12.62 | 10.0 | 10.0 |
| 2008 | | | | | | | | | | 12.62 | 10.0 |
| 2009 | | | | | | | | | | | 12.62 |



DIAMOND K GYPSUM MINE SEQUENCE

| <u>YEAR</u> | <u>APPROX MINEABLE GYPSUM</u> |
|-------------|-------------------------------|
| 1999 | 3.3 acres |
| 2000 | 4 acres |
| 2001 | 5 acres |
| 2002 | 4 acres |
| 2003 | 4 acres |
| | 20.3 acres |

CUV-01 Cross Sectional Map

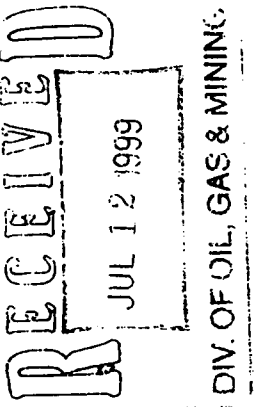
RECEIVED
JUL 12 1953
DIV. OF OIL, GAS & MINING

South Salt Lake
Culverts (2) 4' diameter N



Reclamation Surety Estimate Information

| Activity | Quantity | Units | \$/unit | \$ |
|---|----------|-------|---------|------------|
| 1 Ripping access road - dozer | | | | |
| 2 Regrading access road - dozer | | | | |
| 3 Surface drainage restoration and culvert removal - trackhoe | | | | |
| 4 | | | | |
| 5 Overburden replacement -dozer | | | | |
| 6 Topsoil replacement - dozer | | | | |
| 7 Cripto biotic crust replacement - dozer | | | | |
| 8 Broadcast seeding (~20lb/acre) | 20 | acres | 150 | \$3,000.00 |
| 9 | | | | |
| 10 General site cleanup & trash removal (10% site) | | | | |
| 11 | | | | |
| 12 Reclamation Supervision | 4 | days | 363 | \$1,452.00 |
| 13 | | | | |
| 14 Please fill in amounts for listed activities | | | | |



DR

last revision

04/15/99

filename o:\data\bonding\m15-41.wb3

Emery County

DIV. OF OIL, GAS & MINING

**Soil Test Report
and
Fertilizer Recommendation**

Soil Testing Lab

Utah State University
Logan, Utah 84322-4830
(801) 797-2217
(801) 797-2117 (FAX)

Date Received: 4/14/95
Date Completed: 4/26/95

Name: Diamond K Gypsum
Address: 234 North 500 West

Richfield, Utah 84701

County: Emery

Lab Number: 95010648

Identification: 2 8 "

Crop to be Grown:

| Soil Test Results | | Interpretation | Recommendations |
|--------------------------|------|----------------|---|
| Texture | Loam | | |
| Lime | ++ | Normal | |
| pH | 7.4 | Normal | |
| Salinity - ECe mmhos/cm | 2.7 | Normal | |
| Phosphorus - P ppm | 3.7 | Very Low | 50-70 P ₂ O ₅ , lbs/A |
| Potassium - K ppm | 66 | Low | 140-180 K ₂ O, lbs/A |
| Nitrate-Nitrogen - N ppm | 3.1 | <i>Low</i> | N, lbs/A |
| Zinc - Zn ppm | | | Zinc, lbs/A |
| Iron - Fe ppm | | | |
| Copper - Cu ppm | | | |
| Manganese - Mn ppm | | | |
| Sulfate-Sulfur - S ppm | | | S, lbs/A |

Notes

%Total Nitrogen = .060
CEC (meq/100g) = 6.0

**Soil Test Report
and
Fertilizer Recommendation**

Soil Testing Lab

Utah State University
Logan, Utah 84322-4830
(801) 797-2217
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Date Received: 4/14/95
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Name: Diamond K Gypsum
Address: 234 North 500 West

Richfield, Utah 84701

County: Emery

Lab Number: 95010647

Identification: 1 4"

Crop to be Grown:

| Soil Test Results | | Interpretation | Recommendations |
|--------------------------|------|----------------|---|
| Texture | Loam | | |
| Lime | ++ | Normal | |
| pH | 7.6 | Normal | |
| Salinity - ECe mmhos/cm | 2.8 | Normal | |
| Phosphorus - P ppm | 9.5 | Low | 20-40 P ₂ O ₅ , lbs/A |
| Potassium - K ppm | 100 | Adequate | 80-120 K ₂ O, lbs/A |
| Nitrate-Nitrogen - N ppm | 3.5 | Low | N, lbs/A |
| Zinc - Zn ppm | | | Zinc, lbs/A |
| Iron - Fe ppm | | | |
| Copper - Cu ppm | | | |
| Manganese - Mn ppm | | | |
| Sulfate-Sulfur - S ppm | | | S, lbs/A |

Notes

%Total Nitrogen = .095
CEC (meq/100g) = 8.0

*If you require recommendations, please
contact the lab.*

UT 0611
15/11

✓ Mr. Tony Gallegas
Divison of Oil, Gas, and Mining
355 West North Temple
3 Traid Center, SLC, UT 84180-1203

6 January 1995

S/015/041

RECEIVED

JAN 10 1995

Mr. Neil Simmons
BLM San Rafael Resource Area
900 N. 700 E
Price, UT. 84501

3809 UTU69860 UT-067

RECEIVED

SW/4 Section 29, T. 22 S., R. 9 E. Diamond K Gypsum Rock Quarry Emery County

VEGETATION: A plant survey was completed on the Carmel Formation gypsiferous soils. These soils have a restricted, limited flora. Atriplex confertifolia shadscale and Oryzopsis hymenoides indian rice grass are the only positive native forage plants. All other plants are considered to be opportunist weeds of limited forage potential. These opportunist weeds generally have a Eurasian origin. (Anasasi ? or Pilgrim ?)

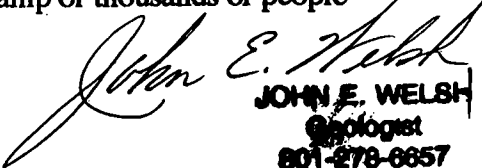
RESEEDING: The recommended BLM-UDOT seed mixture for the San Rafael Area is planted in indoor flats in the Carmel gypsiferous top soil taken from the quarry site. This test is being run under 65 degree temperature and daily watering to determine what will actually grow under ideal conditions in mon mineralogic gypsum.

The natural plant distribution in the field shows that moisture retention and slope direction controls the density of plants. South slopes are barren, small protected gullies and north slopes have maximum plant density. Flat areas maybe barren of plants or have uniform distribution of plants. The line statistical survey of plants was measured in the highest population on a flat in the SW/4 sec 29, an area to be quarried in 1995.

Artificial reseeding is of questionable value. Especially, if the seed mixture is not suitable for the mono mineralogic gypsum soils. **Transplantation** may be practical and successful for Atriplex confertifolia and Oryzopsis hymenoides. Several dozen plants were transplanted in November '94 as a test trial.

RECLAMATION: Reclamation of Area A should be designed to avoid sheet floods and rill wash caused by cloudbursts. The excavated quarry floor will have a 3 to 4 degree northwesterly inclined plane after removal of the gypsum rock. Top soil replaced upon this inclined plane should be contoured, terraced, and deeply furrowed in an EW direction. Slopes should face North to Northwest, and depressions of all varieties should be closed so as to retain moisture. North slopes and water capture are paramount to success in getting artifical and natural revegetation.

BONDING: The reclamation bond for Area A approximately 12 acres have been set at \$2.000 per acre. In the Diamond K quarry which ends up with a broad gently incline surface it is debateable as to whether the esthetics are improved over the original. The market value of marginal grazing acreage along the Moore Road, at most would be a few hundred dollars per acre. I would like to raise the question as to what is really reclamation is a semi-desert wasteland. UDOT "reclaimed" the several miles through Carmel gypsum along the interstate 70, is this the standard for the San Rafael Resource Area? I feel that BJ reclaimed prospect areas near the Moore Road had excellent to poor recovery over 15 years. It can be argued that recovery is mostly natural by what plants actually grew. It is a fact that in ten years almost any disturbed area in the West will recover to natural plant populations. In 100 years all evidence of a 1890's mining camp of thousands of people has disappeared into climax juniper and pinon.


JOHN E. WELSH
Geologist
801-278-8857
4780 Bonar St.
UT 84447

BOTANICAL IDENTIFICATION
GYPSUM ROCK OF THE CARMEL FORMATION
T. 22, 23 S., R. 8, 8 1/2, 9 E. SLB&M
EMERY COUNTY, UTAH

Undisturbed Flora:

| | |
|---|--|
| <i>Oryzopsis hymenoides</i> | Indian rice grass |
| <i>Atriplex confertifolia</i> | Schadscale type A oval leaf Schadscale type B elongate leaf |
| <i>Atriplex gardneri</i> var <i>cuneata</i> | Castlevalley saltbrush |
| <i>Chryothamus Greenei</i> | Green's rabbitbrush |
| <i>Chryothamus nauseosus</i> var <i>consimilis</i> | Greenish rubber rabbitbrush |
| <i>Lepidium montanum</i> Nutt var <i>jonesi</i> | Jones's pepperplant |
| <i>Phacelia rafaellensis</i> | |
| <i>Ephedra torreyana</i> | Mormon tea |
| <i>Opuntia fragilis</i> | prickly pear cactus |

Introduced by reseeding in Disturbed Areas:

| | |
|-----------------------------|---------------|
| <i>Agropyron desertorum</i> | crested wheat |
| <i>Halogeton glomeratus</i> | |

ACKNOWLEDGEMENT:

Mike Windham and Loreen Allphin of the Utah Museum of Natural History compared specimens with types at the museum. Their expertise is appreciated. Dr. Stanley Welsh (BYU) and Dr. Cyrus McKell (Weber State) discussed the problems of reseeding. S. Welsh made the suggestion of transplanting only the major desired species, and letting the opportunists reseed through natural processes.

NATURAL UNDISTURBED CONDITIONS
OVERLYING GYPSUM ROCK
SAN RAFAEL RESOURCE AREA
T. 22, 23 S., R. 8, 8 1/2, 9 E.

Vegetation Survey: A vegetation survey of 5 lines of 100 feet at ten foot spacing was done in the SW/4 of the NE/4 of the SW/4 of Section 29, T. 22 S. , R. 9 E. This survey was accomplished in an area of maximum vegetation cover within Area A, the area now being actively quarried.

Within Area A, South of the Moore Road, in the NW/4 of the SW/4 of Section 29, the Ground Cover is described as

| | | |
|-----------------|-----|------------------|
| Vegetation | 20% | |
| Litter | 5% | |
| Rock and Frags | 25% | |
| Bare | 50% | |
| Revegetation at | 70% | idealized at 14% |

Abundant Positive Forage Plants:

| | |
|-------------------------------|-------------------|
| <u>Atriplex confertifolia</u> | shadscale |
| <u>Oryzopsis hymenoides</u> | indian rice grass |

Abundant Weeds:

| | |
|--------------------------------|-------------------------|
| <u>Atriplex gardneri</u> | castle valley saltbrush |
| <u>Chrysothamhus greenei</u> | Green's rabbitbrush |
| <u>Chrysothamnus nauseosus</u> | rubber rabbitbrush |
| <u>Lepidium montanum</u> | Jones's pepperplant |

These above plants make up 99% of the flora.

PLANT DENSITY: Plant distribution is controlled by both direction and degree of natural slopess. South facing slopes are essentially barren. Natural flat areas have well developed cryptogamic soils with both dormate and active lichen cover. Plants maybe absent from these flats increasing in gullies to a maximum on North facing slopes. Moisture availability and retention is the control for plants.

SOIL FORMATION: Soil thickness varies from none on gypsum rock to several ten feet in joints and sink holes. The A zone humic layer is absent or at best a few millimeters if the lichen growth is considered as the organic layer. The B zone is plus 75% gypsum with silt and clay derived from either overlying lithologies or blown and washed into the gypsum. The C zone is plus 80% gypsum grading into 98% gypsum rock. The impure surface layer is better named a regolith rather than "top soil"

It should be recognized that the gypsiferous "top soil" is a very restricted, inhospitable environment for most plants.

The soils on the limestone beds of the Carmel Formation are completely different from those on the gypsum rock. A cloudburst over the I-70 materials quarry near the Moore interchange produced a flash flood which carried limestone mud and clasts westward in the South Salt Wash drainage and irreversibly change the riparian environment for miles through the gypsum walled canyons. There is no way that the quarrying of gypsum rock and the bypassing of some gypsum dust, soil, or rock fragments will ever negatively effect the Salt Wash Drainage. In fact, if it were so decided that reclamation of the South Salt Wash Drainage was desirable, then all of the reclaimed gypsiferous "top soil" should be designed to flush into South Salt Wash Drainage.

POLLENATION: It was observed while capping and filling in the plastic pipes originally used as claim markers, that one dessicated bird was found in one pipe. To offset this disaster, I wish to report that three plastic pipes have active bee hives. I was so elated to see this use of the plastic pipe, I did not have the heart to destroy the hives.

REFERENCES:

Whitson, T. D. Editor, **Weeds of the West**, revised 1992
The Western Society of Weed Science, P. O. Bx 963,
Newark, CA 94560

Stefferd, A., Editor **Grass, yearbook 1948 USDA**

Welsh, S. L., etc., **A Utah Flora, 1993 BYU**

RECOVERY THRESHOLDS FOR PLANT TYPES FOUND ON
SAN RAFAEL SWELL GYPSUM QUARRY SITE PRIOR TO
EXCAVATION ON OCTOBER 11, 1994

Eleven different plant types were found on a study area of 5000 square feet. The rates of occurrence for each type of plant were determined by running five parallel lines for 100 feet at a spacing of 10 feet, then counting the number of each type of plant within 1 foot of each reference line. A sample of each type of plant was obtained for definitive botanical identification. This report addresses the statistical significance of each rate of occurrence with the objective of establishing a reasonable recovery threshold for each plant type at a full standard deviation above its mean rate of occurrence.

RATE OF OCCURRENCE BY PLANT TYPE:

| TYPE: | LINE1 | LINE2 | LINE3 | LINE4 | LINE5 |
|-------|-------|-------|-------|-------|-------|
| - A: | 7 | 5 | 4 | 3 | 3 |
| - B: | 17 | 19 | 18 | 20 | 6 |
| - C: | 1 | 0 | 0 | 0 | 0 |
| - D: | 1 | 0 | 0 | 0 | 0 |
| - E: | 5 | 4 | 3 | 7 | 1 |
| - F: | 6 | 9 | 10 | 8 | 7 |
| - G: | 0 | 0 | 0 | 0 | 1 |
| - H: | 3 | 2 | 4 | 4 | 3 |
| - I: | 3 | 1 | 2 | 1 | 2 |
| - J: | 2 | 3 | 2 | 4 | 2 |
| - K: | 9 | 4 | 8 | 5 | 4 |

For each of the eleven plant types, the above rates of occurrence permitted the calculation of (1) the mean rate of occurrence, (2) the standard deviation of occurrence and (3) the recovery threshold at a full standard deviation above the mean rate of occurrence. This kind of threshold should serve as a reasonable standard for assessing the recovery of each plant type found prior to excavation at this quarry site after refilling of the quarry with indigenous soil. The necessary time for the recovery of each plant type is dependent on its association with other members of the existing plant community and is not yet known, but the application of calculated recovery thresholds should permit monitoring of the appropriate time intervals. This can also permit selection of plants from other locales on the quarry property where rates of occurrence exceed established means to the

quarry site itself for transplanting until quarry site rates of occurrence achieve calculated recovery thresholds. Knowing the mean rates of occurrence can prevent overuse of available transplant stocks in otherwise undisturbed locales.

CALCULATED RECOVERY THRESHOLDS BY PLANT TYPE

| PLANT TYPE: | MEAN RATE OF OCCURRENCE: | STANDARD DEVIATION: | RECOVERY THRESHOLD: |
|----------------|-----------------------------|------------------------|------------------------|
| A: | 4.4 | 1.67 | 6.07 |
| B: | 16.0 | 5.70 | 21.70 |
| C: | 0.2 | 0.45 | 0.65 |
| D: | 0.2 | 0.45 | 0.65 |
| E: | 3.8 | 2.64 | 6.44 |
| F: | 8.0 | 1.80 | 9.80 |
| G: | 0.2 | 0.45 | 0.65 |
| H: | 3.2 | 0.79 | 3.99 |
| I: | 1.8 | 0.84 | 2.64 |
| J: | 2.6 | 0.22 | 2.82 |
| K: | 6.0 | 2.34 | 8.34 |

For those plant types which have remarkably low rates of occurrence (e.g. Types C, D, and G) the simplest approach may be to transplant these away from future quarry sites then just move them back after refilling is accomplished. For instance, Type C is a small cactus which is easily recognized at any time of the year and like other commercially grown small cactuses should do well on transplanting. A 50,000 square foot quarry site is only going to have about 10 of these cactuses so it is not going to be labor intensive to move them anyway.

RESEEDING RESULTS: UDOT and BLM (recomended) 1987-

Recomended reseeding lists from UDOT and the BLM are nearly identical for the same area underlain by the Carmel Formation on the West flank of the San Rafael Swell. There are two major rock types in the Carmel Formation. The limestone terrain supports the pinon/juniper forest and its associated grasses and shrubs. There is an abrupt change from this diversified flora at a sharp boundary with the lithologic change into the gypsiferous units of the Carmel Formation.

The only species listed UDOT-BLM which grow immediately above gypsum rock are Oryzopsis hymanoides indian ricegrass and Atriplex confertifolia shadscale.

There is the very real question as to whether the UDOT-BLM recomended seed mixture has or will succeed on gypsiferous reclaimed areas. Evidence of any success of reseeding along the Interstate 70 through the gypsiferous Carmel Formation is lacking. Areas disturbed by J. Welsh along the Moore Road have been reseeded over and over in the past ten years. Some plants of Agropyron desertorum crested wheat have been established. The other plants which have restablished themselves are those which are in the flora list derived from an on site plant count, not those on the recomended UDOT-BLM lists. It appears that natural reseeding is the successful process and artifical reseeding is an exercise in futility on the gypsiferous reclaimed areas.

RECOMENDED PRACTICE FOR RECLAMATION:

1. Surface reclaiming must be designed to avoid sheetfloods and rill wash caused by cloudbursts. Moisture retention and natural seed catchment can be accomplished by contouring and deeply furrowing the top soil so that there is no down slope movement of water. After the gypsum rock is stripped off, what results is an inclined plane with a 3 to 4 degree northwest dip. It is this plane which must be covered by the stockpiled "top soil" in such a way that water is not allowed to run off and gully the soft prepared ground.

2. With the "top soil" prepared to preserve the maximum moisture in furrows, then reseed plant only:

| | |
|-------------------------------|-------------------|
| <u>Oryzopsis hymanoides</u> | indian rice grass |
| <u>Atriplex confertifolia</u> | shadscale |
| <u>Agropyron desertorum</u> | crested wheat |

3. Transplant as a test:

Oryzopsis hymanoides
Atriplex confertifolia

**RECOMENDED RESEEDIDNG
CARMEL FORMATION
WEST FLANK OF THE SAN RAFAEL, EMERY COUNTY, UTAH**

AUGUST 30, 1991 BLM Office Price, Utah Certified 872-630-766

Oryzopsis hymenoides

Stipa comata

Hilaria jamesii

Atriplex confertifolia

Atriplex canescens

Ceratoides (Eurotia) lanata

Melilotus officinalis

Sphaeralcea coccinea

In addition to these species the Utah Department of Transportation reseeded a few other grasses and shrubs along Interstate U. S. 70, through the gypsiferous units of the Carmel Formation. See table below.

| SEEDING SCHEDULE | | | | |
|------------------|------------------------|-----------------------|------------------------|----------|
| SEED NO. | NAME | | LBS LIVE SEED PER ACRE | |
| | BOTANICAL | COMMON | METHOD A | METHOD B |
| GRASS | | | | |
| 1 | BOULEAUUS GRACILIS | BLUE GRAMA | 2.0 | 4.0 |
| 2 | HILARIA JAMESII | GALLETA | 1.5 | 2.5 |
| 3 | ORYZOPSIS HYMENOIDES | INDIAN RICE GRASS | 5.5 | 9.0 |
| 4 | ORYZOPSIS HYMENOIDES | INDIAN RICE GRASS | 4.0 | 6.0 |
| 5 | SPOROBOLUS AIROIDES | ALKALI SACKTON | 0.5 | 1.0 |
| 6 | SPOROBOLUS CRYPTANDRUS | SAND DROP SEED | 0.25 | 0.5 |
| 7 | STIPA COMATA | NEEDLE AND THREAD | 3.5 | 6.0 |
| 8 | STIPA COMATA | NEEDLE AND THREAD | 2.75 | 5.0 |
| 9 | STIPA COMATA | NEEDLE AND THREAD | 1.5 | 2.5 |
| 10 | PENSTEMON SP. | PENSTEMON | 1.0 | 2.0 |
| SHRUBS | | | | |
| 13 | ARTIPLEX CANESCENS | FOUR WINGED SALT BUSH | 1.0 | 2.0 |
| 16 | ARTIPLEX CONFERTIFOLIA | SHADSCALE/HOPSAGE | 0.5 | 1.0 |
| 17 | CHRYSTHARUS NAUSEOSUS | RABBIT BRUSH | 0.25 | 0.5 |
| 18 | EPHEDRA VIRIDIS | MORMON TEA | 0.5 | 1.0 |
| 22 | NAHONIA A. FREMONTII | FREMONT NAHONIA | 1.0 | 2.0 |
| MISC. | | | | |
| 23 | PIRUS EDULIS | PINYON PINE | 1.25 | 2.5 |
| 25 | YUCCA | YUCCA | 0.75 | 1.25 |

| SEEDING SCHEDULE | | | | |
|------------------|------------------------|---------------------|------------------------|------------|
| SEED NO. | NAME | | LBS LIVE SEED PER ACRE | |
| | BOTANICAL | COMMON | METHOD "A" | METHOD "B" |
| 1 | Oryzopsis hymenoides | INDIAN RICEGRASS | 5.5 | 9.0 |
| 2 | Oryzopsis hymenoides | INDIAN RICEGRASS | 4.5 | 8.0 |
| 3 | Sporobolus airoides | ALKALI SACKTON | 0.5 | 1.0 |
| 4 | Stipa comata | NEEDLE-AND-THREAD | 3.5 | 6.0 |
| 5 | Stipa comata | NEEDLE-AND-THREAD | 1.5 | 2.5 |
| 6 | Stipa comata | NEEDLE-AND-THREAD | 2.75 | 5.0 |
| 7 | Sporobolus cryptandrus | SAND DROP SEED | 0.25 | 0.5 |
| 8 | Hilaria jamesii | GALLETA | 1.5 | 2.5 |
| 9 | Bouteloua gracilis | BLUE GRAMA | 0.25 | 0.5 |
| 10 | Atriplex confertifolia | SHADSCALE | 1.0 | 2.0 |
| 11 | Atriplex confertifolia | SHADSCALE | 0.5 | 1.0 |
| 12 | Atriplex canescens | FOUR-WING SALT BUSH | 1.0 | 2.0 |
| 13 | Atriplex canescens | FOUR-WING SALT BUSH | 0.5 | 1.0 |
| 14 | Ephedra viridis | MORMON TEA | 1.0 | 2.0 |
| 15 | Ephedra viridis | MORMON TEA | 0.5 | 1.0 |
| 16 | Eurotia lanata | WINTERPEY | 0.5 | 1.0 |
| 17 | Eurotia lanata | WINTERPEY | 1.0 | 2.0 |
| 18 | Cercocarpus montanus | MOUNTAIN MAHOGANY | 1.0 | 2.0 |
| 19 | Parthenocissus vitacea | ANTelope BITTERBUSH | 2.0 | 3.0 |
| 20 | Schottia grandifolia | SCOTTIA GRANDIFOLIA | 0.25 | 0.5 |

SOIL TEST REPORT and FERTILIZER RECOMMENDATIONS

SOIL TESTING LABORATORY
Utah State University UMC 4830
Logan, Utah 84322
(801) 797-2217

Date 10/27/94

Name JOHN E. WELSH
Street 4780 BONAIR ST
City, State HOLLADAY, UTAH ZIP 84117

| SAMPLE IDENT. | CROP TO BE GROWN | SOIL TEXTURE | LAB NO. |
|------------------|------------------|--------------|-------------|
| 1) <u>RAFAEL</u> | <u>DESERT PL</u> | <u>LOAM</u> | <u>1228</u> |
| 2) _____ | _____ | _____ | _____ |
| 3) _____ | _____ | _____ | _____ |
| 4) _____ | _____ | _____ | _____ |

Copy sent to Extension office
in SALT LAKE County.

| SOIL TEST RESULTS | Very Low | Low | Adequate/Normal | High | Very High | RECOMMENDATIONS | Notes |
|---------------------------|----------------------|----------|-----------------|----------|----------------------|--|---------------|
| NITRATE-NITROGEN N ppm | 1) _____ | 2) _____ | 3) _____ | 4) _____ | | _____ N lbs/A | _____ |
| PHOSPHORUS P ppm | 1) <u>2.3 ***</u> | 2) _____ | 3) _____ | 4) _____ | high rainfall desert | _____ - <u>150-170</u> _____ - <u>50-70</u> P ₂ O ₅ * lbs/A | _____ b, c, d |
| POTASSIUM K ppm | 1) <u>44</u> ***** | 2) _____ | 3) _____ | 4) _____ | | _____ K ₂ O* lbs/A | _____ |
| SALINITY mmhos/cm | 1) <u>10.4</u> ***** | 2) _____ | 3) _____ | 4) _____ | | _____ | _____ e |
| pH | 1) <u>8.0</u> ***** | 2) _____ | 3) _____ | 4) _____ | | _____ | _____ f |
| LIME | 1) <u>++</u> ***** | 2) _____ | 3) _____ | 4) _____ | | _____ | _____ |
| | 1) _____ | 2) _____ | 3) _____ | 4) _____ | | _____ | _____ |
| | 1) _____ | 2) _____ | 3) _____ | 4) _____ | | _____ | _____ |

NOTES:

* P₂O₅ x .45 = P K₂O x .82 = K

We do not have enough data to give a reliable recommendation for N fertilizer.

This P recommendation is for normal crop production plus substantial buildup for future crops. Retest after 2 years.

See Note 6 on reverse.

See Note 10b on reverse.

At this sample's salinity level, this pH value indicates a probable sodium problem. Consult local Extension or UCS office or this lab before fertilizers are applied.

f further assistance, please contact Jan at the Lab

You may need to modify these recommendations in order to achieve maximum economic return under your specific conditions of weather, finances and management.

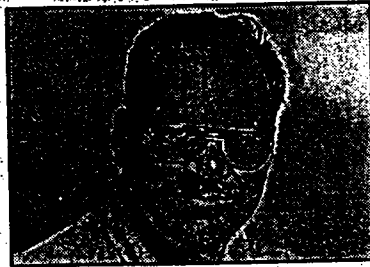
Cattle are a part of — — not an intrusion on — — Americans' way of life

It is time to dispel the myth that ranchers have a sweetheart deal of any kind.

Grazing is the principal ecologically sound commercial use of semi-arid lands. Recreation in limited areas of high appeal brings money into the state. But most rangeland lacks the features sought by vacationers.

Hunting generates fees. But fees get soaked up by bureaucracies. Where the land is devoid of materials or of recreational potential, only grazing creates wealth for society at large.

Much is made of the archaeological value of the desert. Grazing is a primary link in cultural evolution. Hunter-gatherers who made the transition to herding, then to agriculture, were the first to build up enough wealth to support civilization. Native sites and artifacts should



John Welsh

be preserved. But the range cow is a pedigreed artifact, a direct and living connection with ancient times.

In some interpretations, grazing is seen as obliterating the archaeological record. Far from it. Those old enough to remember when arrowhead collecting was legal also remember that every year a new crop of arrowheads was turned up by the bene-

tilling of the desert soil by cows. Roads and trails kept open by ranchers provide access to petroglyphs, old camp sites and areas suggestive of the life that undisturbed natives experienced.

Given time, Native Americans inevitably would have developed herding. Buffalo culture was only an imaginative spark away from the transition to husbandry. If Europeans had not complicated matters, intertribe warfare between native tribes would have forced the eventual division of buffalo range and the domestication of buffalo as cattle.

Range management is older than the Old Testament. Rewrite history from the cow's-eye view and you would have essentially the human legend. Only a shallow society, a decadent society losing touch with its roots, could

turn up its nose at ranching. The words kin and kine, derive from the same source. What could be more closely related than a family and its cattle?

The earliest kings were members of the bloodlines, that is of the kin, with the most kine. Not only protectors of the herd, kings were the patrons of artists, storykeepers, musicians and mathematicians.

Like it or not, cattle are still king.

To be a cattleman is to vie for seniority among the oldest professions.

To this day, no separation can be made between the production of wealth and the fertilization that wealth provides to society. Nevertheless, fewer people than ever do the actual work that makes money for everyone. And more and more people turn their

backs on the stench and commotion of production. Yet cultural decline cannot be far behind the repudiation of basic industry.

The profit on cattle is in line with or below profits made in other industries. For example, with extraordinary luck, a 600-pound calf raised from birth, mainly on public dry pasture and sold at 10 months of age might bring \$630. Taking the rule of thumb that the breakeven point on cattle is 70 cents a pound, the calf would yield a profit of \$210, or 33 percent.

More typically, 900-pound 18-month-old steers raised exclusively on hay and private irrigated ground, recently sold for \$700 each, yielding only \$90 per animal, or only a 13 percent profit.

Keep in mind that the standard retail mark-up in most businesses is 50 percent or much higher.

Many retail auto parts outlets routinely mark their merchandise up by 100 percent.

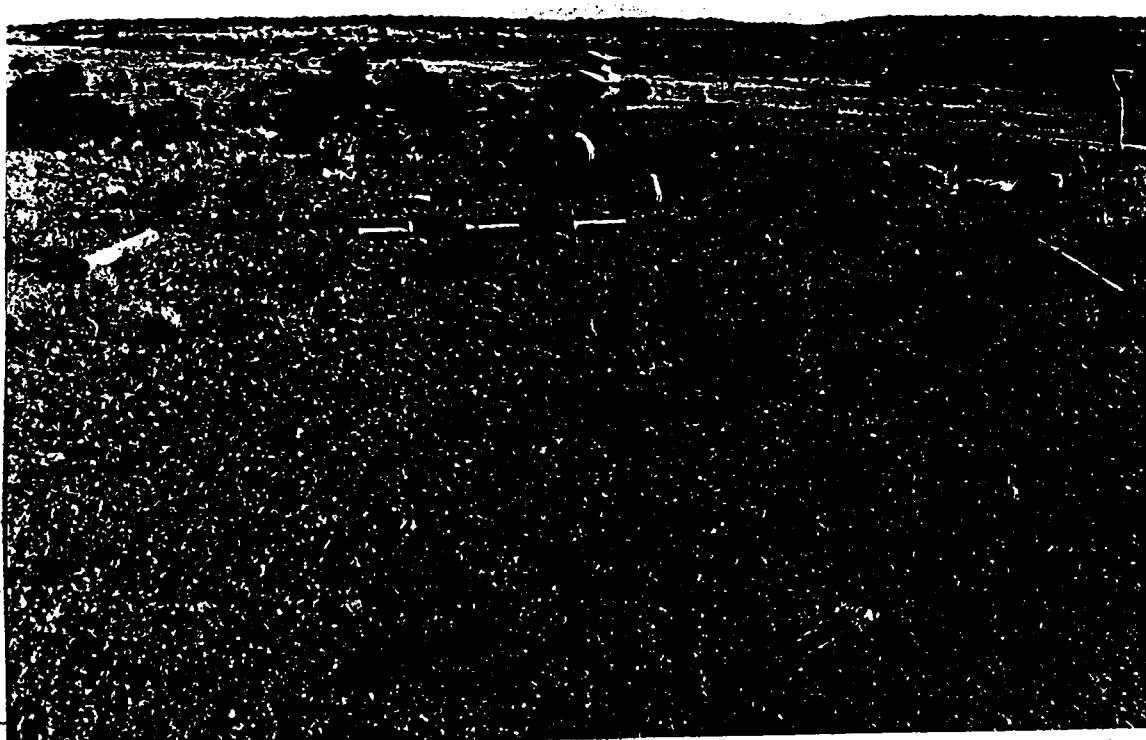
Increased grazing costs endanger the profits ranchers need to survive. A rancher cannot simply raise his prices. The price is discovered at the auction.

The public should shed the image of the rancher as the freebooting buckaroo, gazing into the high mountains as his herds lows quietly before bedding down near the chuck wagon. This bucolic picture leaves out the dust and the flies, the long hours, the lumps and the headaches. The truth is that most hard-working ranchers, with a little luck, and with a lot of knowledge and experience, make about as much money as any other middle managers.

John Welsh is a salvage logger based in Southwest Idaho.

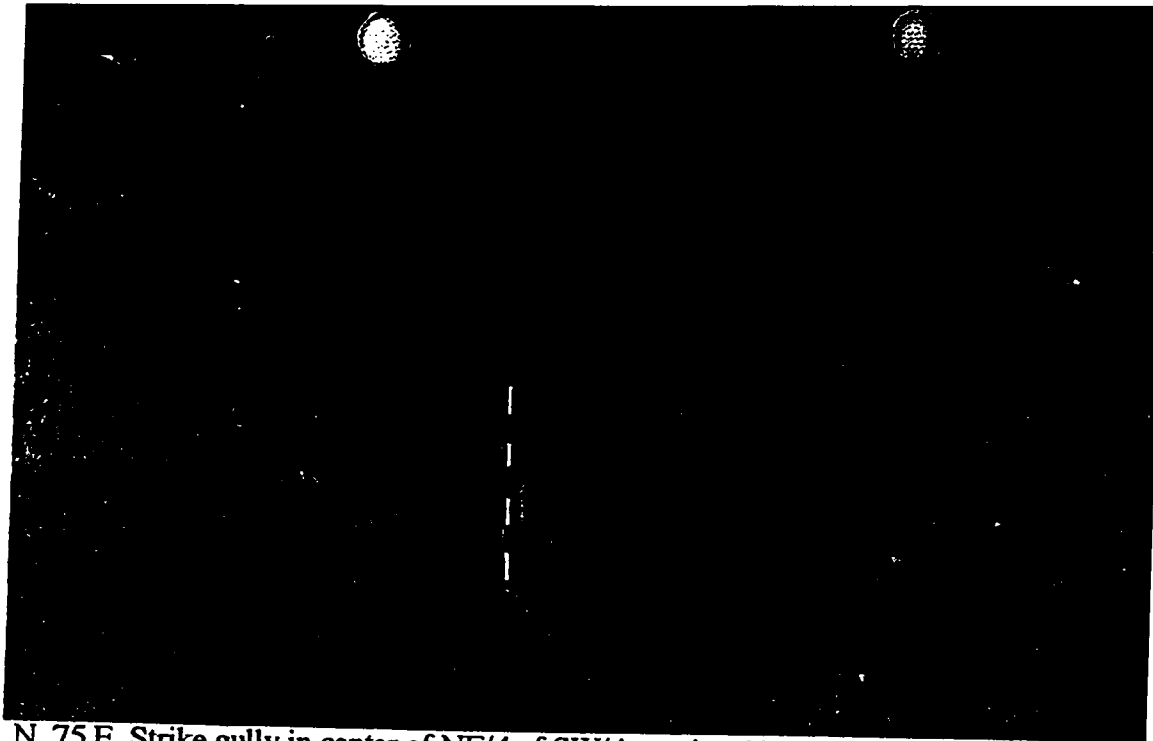


SW/4 of the NE/4 of the SW/4 section 29, Area A, claim BJ-2
Cryptogamic soil - lichen film overlying zero feet to one foot B and C zones of gypsiferous soil. This highly gypsiferous soil overlies 95% purity gypsum rock. Minimum grass and shrub flora on a typical flat surface.

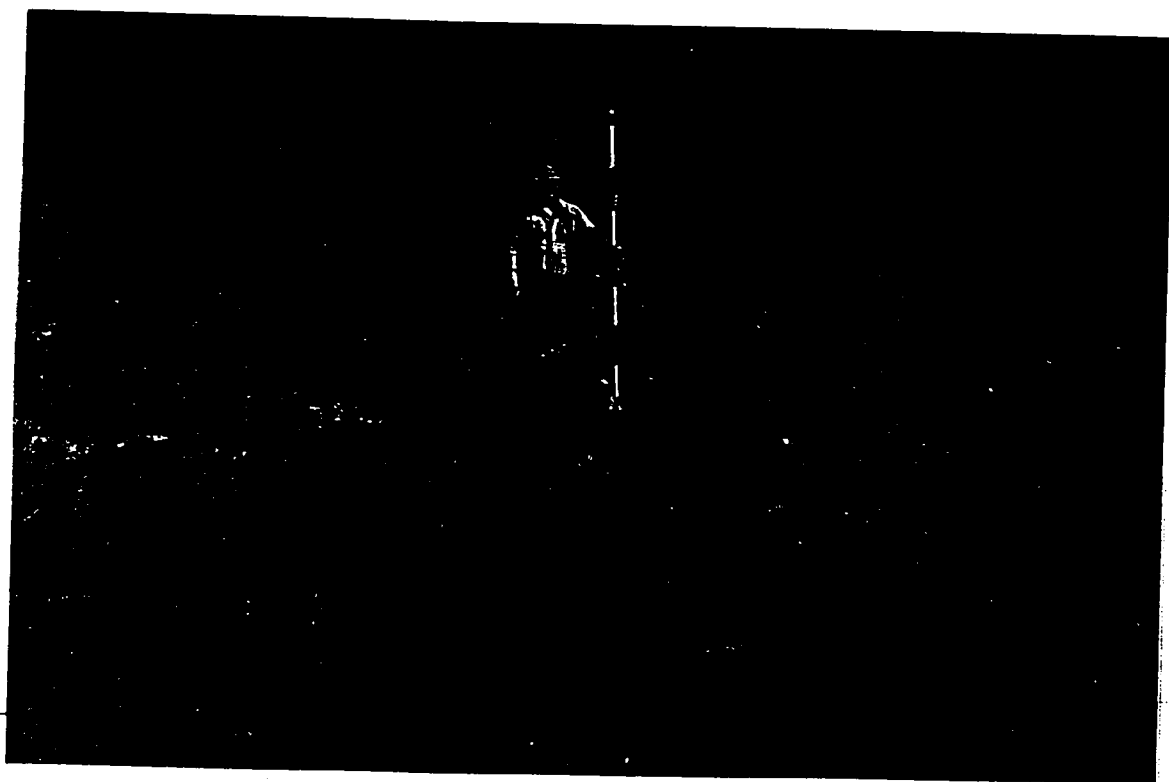


SW/4 of the NE/4 of the SW/4 section 29, Area A, claim BJ-2
Cryptogamic Soil - lichen film overlying zero feet to one foot of B and C zones of gypsiferous soil, directly above 95% purity gypsum rock. An example of the maximum grass and shrub flora on a typical flat surface. This is the area of plant statistical count and of plant identification.

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N. 75 E. Strike gully in center of NE/4 of SW/4 section 29, Area A, claim BJ - 2
 Difference is vegetation density on North facing and South facing slopes.
 At the level of the surveyor the N and S slopes overlie gypsiferous siltstones.
 Gypsum rock is above the red siltstone marker in the background.
 This gully is the 1,000 foot long tributary of South Salt Wash in the middle of section 29.



NE/4 of the SE/4 of section 30, claim BJ-9
 Revegetation Example, approximately 10 years of recovery, reseeded at least three (3)
 times with BLM-UDOT recommended seed mixture plus Agropyron desertorum.
 This is an example of the maximum vegetation density on a level to slightly undulating
 surface. Revegetated area is on the viewer's right. There are two well recovered areas,
 including this one where an investigator may either verify or negate the successful regrowth
 of the BLM-UDOT seed mixture.

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**INDIGENOUS PLANT SPECIES SAN RAFAEL MINING CLAIMS
EMERY COUNTY, UTAH**

A) Growing on cryptogamic gypsiferous soils and gypsum outcrops on the B and J unpatented mining claims and the Sid and Char unpatented mining claims.

| | | |
|--------------------------|----------------------------------|-----------------------------|
| GRASSES: | <i>Oryzopsis hymenoides</i> * | indian rice grass |
| | <i>Muhlenbergia pungens</i> | pungent muhley |
| | <i>Elymus elymoides</i> | squirrel tail |
| SHRUBS: | <i>Chrysothamnus greenii</i> | Green's rabbitbrush |
| | <i>Chrysothamnus nauseosus</i> * | greenish rubber rabbitbrush |
| | <i>Eriogonum ovalifolium</i> | cushion buckwheat subshrub |
| | <i>Eriogonum corymbosum</i> | Freemont's buckwheat |
| | <i>Ephedra torreyana</i> | mormon tea |
| | <i>Atriplex confertifolia</i> * | shadscale |
| | <i>Atriplex gardneri</i> | Castle Valley saltbush |
| | <i>Atriplex canescens</i> * | 4 - wing saltbush |
| | <i>Gutierrezia spathulata</i> | brown snakewood |
| HERBS- FORBS: | <i>Hymenoxys acaulis</i> | aster |
| | <i>Lepidium montanum</i> | Jones's pepperplant |
| | <i>Sphaeralcea coccinea</i> * | Scarlet globemallow |
| | <i>Crythantha</i> sp. | forb |
| | <i>Phacelia rafaelsensis</i> | an erect herb |
| | <i>Gaillardia spathulata</i> | basin blanket flower |
| CACTI: | <i>Opuntia polyacantha</i> | prickly pear |

* these plants are on the DOGM January 18, 1995, Revegetation List.

B) Presently indigenous on limestones and siltstones on BJ mining claims but not growing on the gypsiferous soils, and not recommended for reseeding. These plants will not grow on natural or reclaimed high purity gypsum soils. This is not a comprehensive list of all the plants on the West Flank of the San Rafael Swell, only those species identified for understanding the flora on the B and J mining claims.

| | | |
|-----------------|----------------------------------|-------------------------|
| GRASSES: | <i>Stipa comata</i> * | needle and thread grass |
| | <i>Hilaria jamesii</i> * | curley galleta # |
| | <i>Bouteloua gracilis</i> | blue grama |
| SHRUBS: | <i>Rhus aromatica</i> | skunk bush # |
| | <i>Leptodactylon caespitosum</i> | mat forming shrub # |
| | <i>Ceratoides lanta</i> * | winterfat |
| | <i>Artemisia filifolia</i> | sand sagebrush |
| | <i>Artemisia tridentata</i> | big sagebrush |
| | <i>Forsellesia meionandra</i> | stafftree family # |

| | | |
|---------------|---------------------------------|---------------------|
| | <i>Amelanchier alnifolia</i> | serviceberry # |
| | <i>Eriogonum sp.</i> | pulvinate buckwheat |
| | <i>Mentzelia sp.</i> | stick leaf |
| HERBS- | <i>Enceliopsis nudicaulis</i> | naked stem # |
| FORBS: | <i>Machaeranthera canescens</i> | aster |
| | <i>Castilleja scabrida</i> | indian paintbrush |
| | <i>Oenothera sp.</i> | evening primrose |

*these plants are on the DOGM January 18, 1995, Revegetation List. They grow prolifically on limestones, siltstones, and alluvium but are never seen on high purity gypsum soil. Planting these three above recommended plant species on gypsum soils is technically incorrect.

#these plants occur specifically on the 4-foot tan siltstone marker bed in between the gypsum rock of the Upper Gypsum Unit which is quarried in the GP quarry, West of the DKG quarry.

C) Non native plants and foreign to the West Slope of the San Rafael but recommended for reseeding by DOGM January 18, 1995.

| | |
|------------------------------|--------------------|
| <i>Melilotus officinalis</i> | yellow sweetclover |
|------------------------------|--------------------|

This species has been planted as directed by BLM/DOGM recommended reseeding for over 10 years on reclaimed areas on the B and J claims. Not one plant has been observed. Artificial planting under green house conditions germinated 15% of seeds in gypsiferous soil and maintained plants for six months. These plants did not survive when exposed to outdoor transplant in the gypsum soil.

| | |
|-------------------------|--------------|
| <i>Kochia prostrata</i> | forge kochia |
|-------------------------|--------------|

This species was first planted in October 1995 as directed by BLM/DOGM recommended reseeding on reclaimed areas on the B and J claims. The winter 95/96 on the West Flank of the San Rafael was unusually dry, and the existing plants were under stress when inspected in May. None of the *Kochia* seed produced plants in the reseeded area of claim BJ#2.

Artificial planting under green house conditions germinated over 50% of seed in gypsiferous soil and maintained plants for six months. These plants survived when exposed to outdoor transplant in the gypsum soil. From this experiment it is highly likely that *Kochia prostrata* will germinate and produce viable plants on the reclaimed areas of the mining claims. Further inspection in 1996 may find *Kochia* plants.

It should be emphasized that in October 1995, all of the DOGM January 18, 1995 recommended seeds were planted in the newly reclaimed area of BJ#2 claim. None of these seeds either germinated or produced plants as of May 1996.

**Detachment fold train, Reed Wash area,
west flank San Rafael Swell, Utah:
An example of a limb-lengthening, roll-through folding
process on the eastern margin of the Sevier thrust belt¹**

FRANK ROYSE, JR.²

¹ Received August 31, 1995; Accepted November 21, 1995.

² Consultant, Arvada, Colorado

ABSTRACT

Field observations of a well exposed fold train on the west flank of the San Rafael Swell, Utah, provide new data regarding the process of detachment folding, the possible role of gypsification of anhydrite in promoting decollement, and the geometry and evolution of the eastern margin of the Sevier thrust belt.³ Folding is confined to a 19-m-thick gypsiferous interval within the Middle Jurassic Carmel Formation. The folds are mostly regularly spaced, unfaulted, have no significant plunge, and have round, box, often isoclinal shapes that grade westward to similar, chevron-like forms with detached, round crests. Uplift due to folding of stratigraphic units above their regional level is typically 6 m, and arc wavelength is about 25 m. The entire fold train is bounded below by a singular detachment zone about 0.6-m-thick composed of red clay that lies conformably upon thick, unfolded gypsum beds. Folds are bounded above by a zone of several detachments within a 10-m-thick gypsum unit. The fold train extends westward, down regional dip into the subsurface below unfolded strata, and merges eastward into planar, unfolded strata that dip about 4° northwest.

Folds appear to have developed at a depth of about 600 m by buckling in response to regional horizontal compression during later phases of the formation of the San Rafael Swell in Paleocene time. Fold spacing was largely controlled by a relatively competent yellow calcareous siltstone embedded in a limy, clay shale and gypsum medium. Folds evolved primarily by a limb-lengthening, roll-through process (described by Dahlstrom, 1990) in which beds migrated from initially flat-bottomed synclines through synclinal hinges to become steeply dipping fold flanks as folds amplified and converged along the red clay detachment. Movement along the decollement may have been triggered by introduction of calcium sulfate-saturated water into the red clay detachment with resultant deposition of secondary gypsum crystals as a consequence of isovolumetric gypsification of anhydrite during a time of regional horizontal compression,

and age of the fold train indicates it is the easternmost

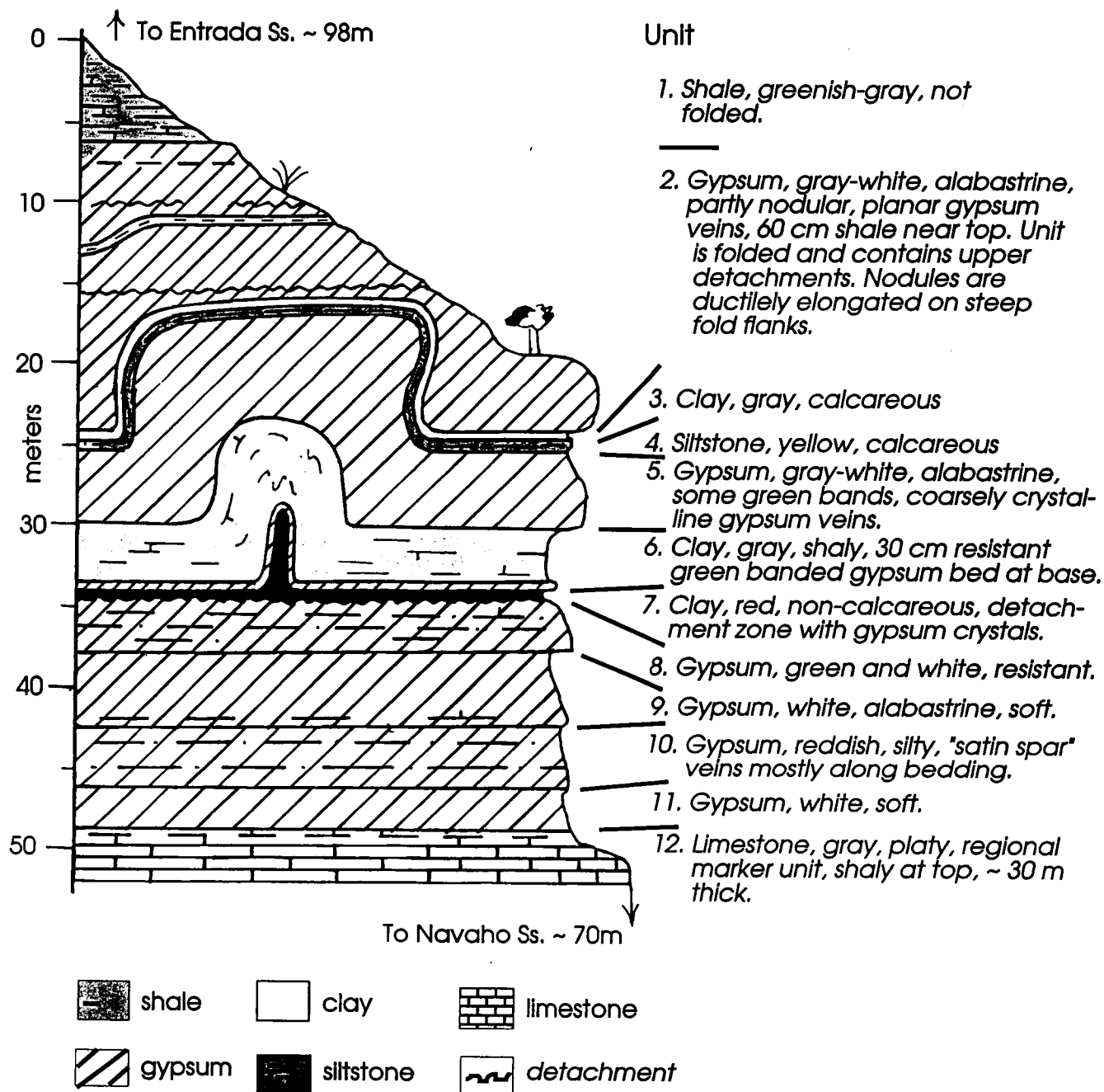


Figure 6. Generalized stratigraphic section and description of folded beds and unfolded adjacent strata of the Mid-Jurassic Carmel Formation.

F. Royse, Jr. April 1966
The Mountain Geologist

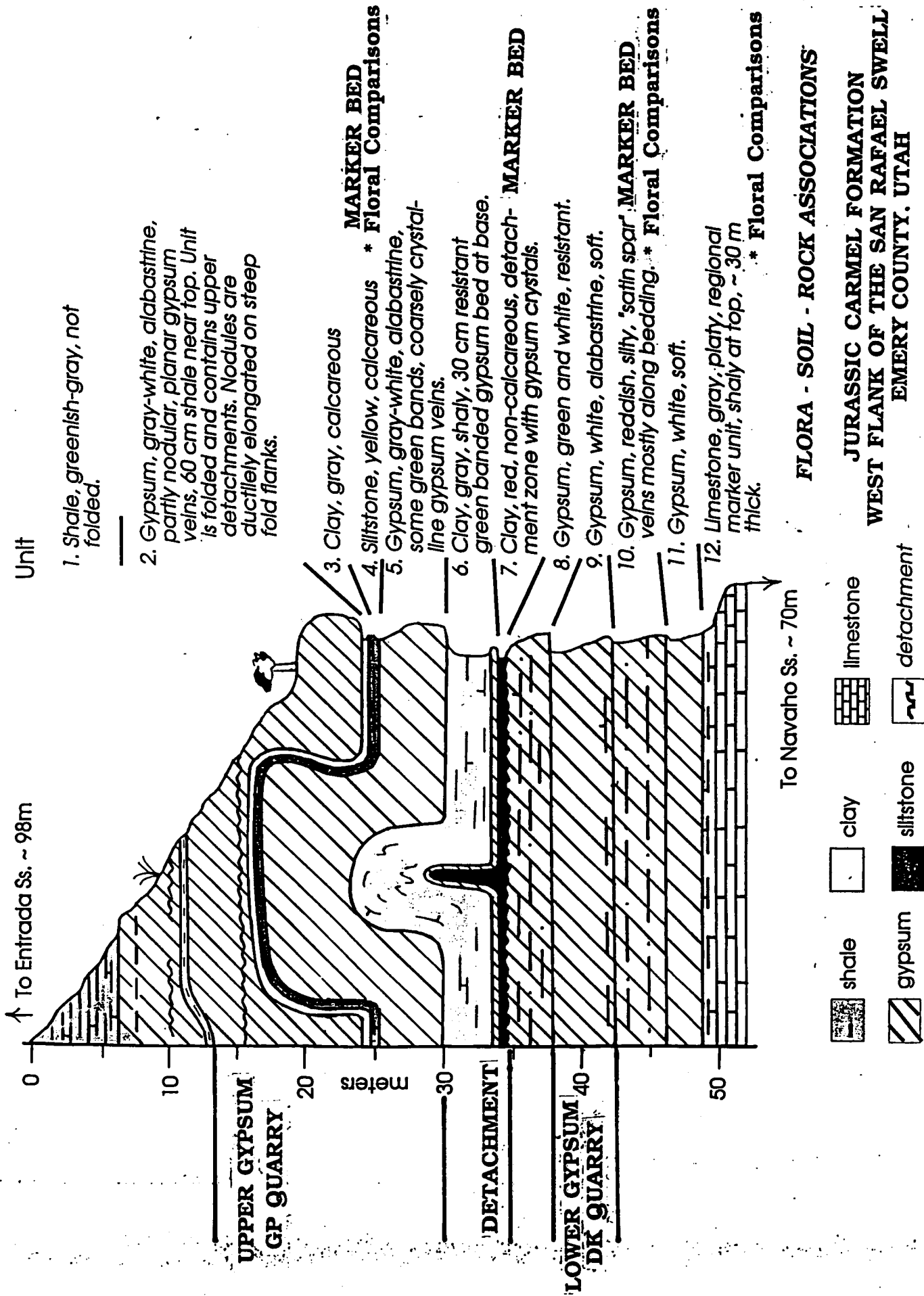


Figure 6. Generalized stratigraphic section and description of folded beds and unfolded adjacent strata of the Mid-Jurassic Carmel Formation.



Photo 1



Photo 2

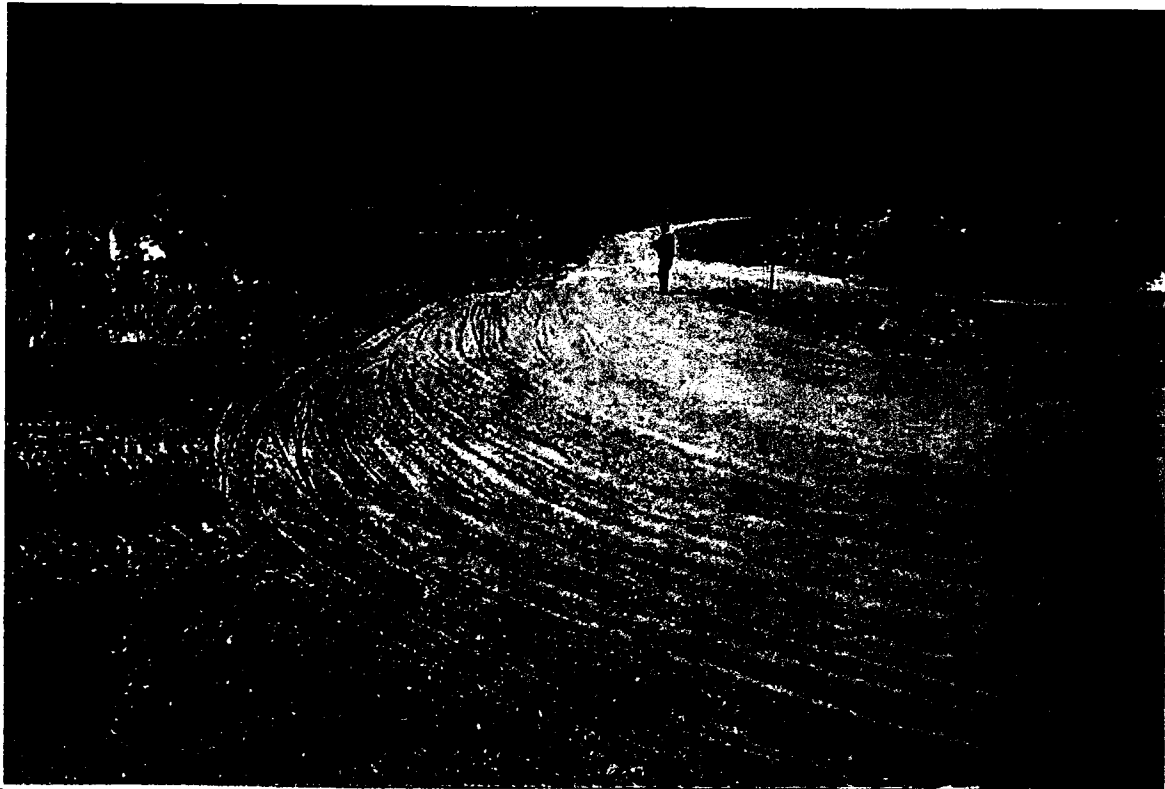


Photo 11

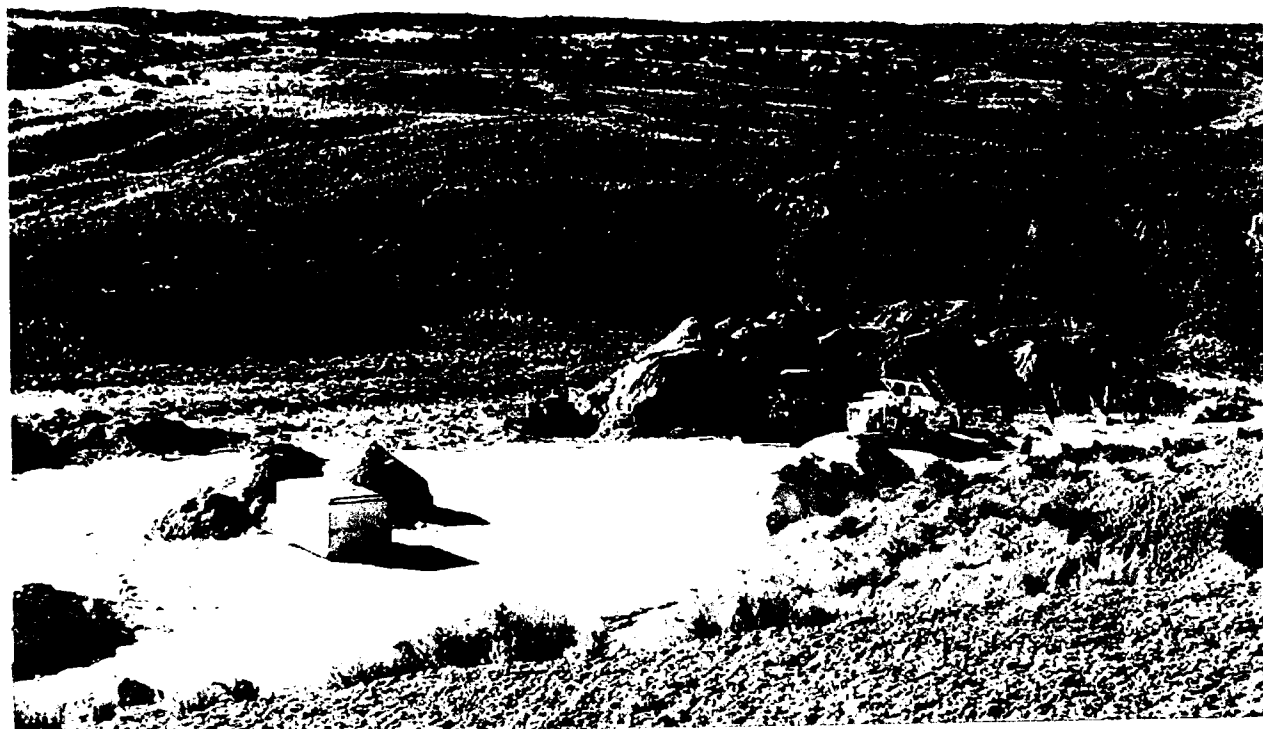


Photo 5